T-12

PB 131891—T12

(2)

CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT

19 December 1958

Distributed Only By
U.S. DEPARTMENT OF COMMERCE
OFFICE OF TECHNICAL SERVICES
WASHINGTON 25, D.C.

Issued Semi-monthly. Price: Per year $28.00; Single issue $2.75.

Use of funds for printing this publication approved by the
Director of the Bureau of the Budget July 31, 1958.

Approved For Release 1999/09/08 : CIA-RDP82-00141R000100210001-0

PLEASE NOTE

This report presents unevaluated information extracted from recently received publications of the USSR, Eastern Europe, and China. The information selected is intended to indicate current scientific developments and activities in the USSR, in the Sino-Soviet Orbit countries, and in Yugoslavia, and is disseminated as an aid to United States Government research.

SCIENTIFIC INFORMATION REPORT

Table of Contents

NOTE: Items in this report are numbered consecutively.

I. ASTRONOMY

1. Spectrograph of Kuchino Observatory

"High Light-Power Nebular Spectrograph of Kuchino Astronomical Observatory," by N. N. Pariyskiy. Soobshch. Gos. astron. in-ta im. P. K. Shternberga, 1957, No 101-102, 3-32 (from Referativnyy Zhurnal -- Astronomiya i Geodeziya, No 9, Sep 58, Abstract No 5771)

The high light-power nebular spectrograph of the Kuchino observatory was constructed by the author for observations of total solar eclipses. The dispersing system is composed of three prisms of uviol glass with refracting angles of 45°. The high transparency of the prisms permits obtaining spectra up to wavelength 3500. The light beam after the nebular slit crosses the prism system, the Schmidt lens, and, after having been reflected by the spherical mirror, focuses on the cylindrical surface of the box. The maximum deviation of the cylindrical surface of the box from the spherical focal surface is 0.01 mm. The focal length of the camera objective is 200 mm; the nebular slit is at a distance of 20 meters from the camera; the operating light power of the spectrograph is 1:2.74; the dispersion is 65 A/mm at H_{gamma}; the real purity of the spectrum is $p = \lambda/\Delta\lambda = 1000$ (for $\lambda = 3660$).

The spectrograph may be focused on infinity and on the slit. In the first case the efficient operating field of the spectrograph equals 8 - 10' which corresponds to 0.35 mm on the film. In this section averaging of the spectrum occurs covering a magnitude of several tens of angstroms. This involves great difficulties in processing. Therefore, the focusing on infinity may be of interest only during photography of chromospheric crescents, because it excludes the other half of chromospheric rings. During the focusing of the spectrograph on the slit the averaging region for each element of the slit represents an ellipse elongated along the slit with axes A = 14'.1 and B = 12'4. The whole slit cuts on the sky a little band 12'4 wide and 58'.3 long.

The slits of the spectrograph are exchangeable. For the calibration of spectra a stage slit is used. The supply is provided by means of a coelostat and supplementary mirrors. The spectrograph has a searcher. The construction of the spectrograph is described in detail as well as its use under field conditions.

The spectrograph was used for the observation of the total solar eclipse on 21 September 1941 near Alma-Ata. During later observations of eclipses the transition from the nebular method to the slit with supplying objective and collimator was made. In 1954 the supplying optics and the collimator optics were replaced by mirrors.

2. Observations by the Kuchino Spectrograph

"Observations of the Total Solar Eclipse of 21 September 1941 With the Nebular Spectrograph," by N. N. Pariyskiy, Soobshch. Gos. astron. in-ta imeni P. K. Shternberga. 1957, No 101-102, 33-54 (from Referativnyy Zhurnal -- Astronomiya i Geodeziya. No 9, Sep 58, Abstract No 5800)

Observations of the total Solar eclipse 21 September 1941 by means of the nebular spectrograph of the Kuchino observatory (see preceding item) are reported. The observations were carried out by the expedition of the State Astronomical Institute imeni Shternberg near the mountains of Zailiyskiy Ala-Tau (φ = 43°11'11" ± 3" North latitude; λ = +76°57'08" ± 4" East longitude; H = 1253 m ± 20 m). The astronomical conditions of the eclipse are reported. The timing determination of the second contact is dealt with in detail. The author made use of observational data on the chromosphere spectrum and the solar limb obtained by V. G. Fesenkov by means of the slit spectrograph. The timing of the second contact was determined from these spectra as well as the timing of the vanishing of the continuous spectrum of the photosphere, taking into account corrections for the relief of the lunar limb. The profile of the lunar limb is computed from charts by Hayn. The observed timing of the second contact was lagging, by comparison with that precomputed by A. A. Mikhaylov, by 1.8 sec., which corresponds to a decrease of the correction admitted by Mikhaylov for the lunar coordinates $\Delta\alpha$(of 0".9. A more important correction obtained by N. G. Gusev (Trudy ekspeditsiy po nablyudeniyu polnogo solnechnogo zatmeniya, 21 September 1941 [Transactions of the Expedition for Observation of the Total Solar Eclipse, 21 September 1941], 1949) ($\Delta\alpha$(= -3".7; $\Delta\alpha$(= + 1".2) evidences according to the author, an unsatisfactory accuracy in determining the errors of lunar coordinates from measurements of crescents during the eclipse.

For five pictures of the corona data on the start and the end of the exposure, width of the slit, focusing of the spectrograph (on the slit or on the sky), and the position of the slit are given.

3. Indirect Effect of Radioactive Sulfur on Plants Aggravated

"Reaction of Plants to Radioactive Effect of S^{35} During the First and Second Generations," by Prof A. G. Shestakov, Doctor of Agricultural Sciences; G. F. Ivanova, Candidate of Agricultural Sciences; and N. I. Shmel'kova, junior scientific associate; Moscow, Izvestiya Timiryazevskoy Sel'skokhozyaystvennoy Akademii, No 4 (23), 1958, pp 29-40

Tests were conducted on peas, oats, and wheat to determine the indirect effect of radioactive sulfur on first and second generations.

Results indicate that wheat is the most sensitive and peas the least sensitive to radioactive effects of sulfur. Daraging effects (change of color and form of leaves) of S^{35} were first seen in each of the three plants tested when using a dose equal to 0.5 millicuries per vessel of plants. The degree of injury differed and inversely paralleled the radiosensitivity of the plants (wheat yield 37%, oats 68%, and peas 90%). The deleterious effects of radioactive sulfur are not limited to the first generation, but are transferred, through seeds, to the second generation in which they are intensified.

III. CHEMISTRY

Catalysis

4. Effect of Catalytic Conditions on the Sulfur Content of a Barium-Alumino-Vanadium Sulfuric Acid Catalyst

"Investigation of the Effect of Catalytic Conditions on the Sulfur Content in a Barium-Alumino-Vanadium Sulfuric Acid Catalyst," by B. P. Korneichuk, V. A. Roiter, N. A. Stukanovskaya, P. B. Rzaev, and Ya. V. Zhigailo, Problemy Kinetiki i Kataliza, Vol. 9, 1957, pp 329-336 (from Referativnyy Zhurnal -- Khimiya, Vol. 17, 10 Sep 58, Abstract No 56798 by M. Sakharov)

Changes in the content of S in a barium-alumino-vanadium sulfuric acid catalyst (k) in contact with mixtures of SO_2 (1) and air was studied by means of radioactive indicators employing (1) tagged with S^{35}. It was established that the change in the concentration of (1) in mixtures of (1) and air used for treating (k) at 500°C does not exert any appreciable effect on the quantity of S bound by (k). In treatment of (k) with mixtures of (1) and air of identical composition, the quantity of S bound to (k) reached a minimum at 510°. Changes in the content of S in (k) do not exert any appreciable effect on the catalytic activity of (k).

Chemistry and Technology of Fuels and Propellants

5. Yu. G. Mamedaliyev's Work in the Field of Petrochemistry and Fuels

"Election of Academicians and Corresponding Members of the Academy of Sciences USSR" (unsigned article); Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 9, Sep 58, pp 1135-1154

Yu. G. Mamedaliyev is a prominent specialist in the field of petroleum chemistry. His work on the alkylation of aromatic paraffinic, and cycloparaffinic hydrocarbons formed the basis for industrial syntheses of high-quality components of aviation fuels. Mamedaliyev was awarded the Stalin Prize for this work. He also carried out extensive investigations on the alkylation of benzene and its derivatives and of naphthalene, anthracene, phenathrene, and of a number of cyclanes followed by transformation of the resulting alkyl-substituted hydrocarbons into the corresponding alkyl-aryl sulfonates of different metals, with the result that new monomers and emulsifiers for the rubber industry were synthesized and effective additives for the improvement of the quality of lubricating oils and fuels developed.

Mamedaliyev's research on the halogenation of petroleum gases is of great theoretical and practical importance for the petrochemical industry. A number of processes developed by Mamedaliyev has been adapted for application under production conditions (e. g., processes for the production of carbon tetrachloride, methyl chloride, methylene bromide, etc.). Mamedaliyev has conducted extensive investigations on the catalytic conversion of petroleum products, the development of methods for the production of high-quality fuels for reaction motors, and the synthesis of detergents derived from by-products of the petroleum industry.

Mamedaliyev has published more than 100 scientific articles and a number of monographs.

At a general meeting of the Academy of Sciences USSR held on 20 June 1958, the election of Mamedaliyev as Corresponding Member of the Academy of Sciences USSR in the specialized branch of technical chemistry by the Department of Chemical Sciences was confirmed.

6. Use of Methane and Natural Gas as Automobile Fuel in Moscow

"Miraculous Cylinders" (unsigned article); Moscow, Znaniye - Sila, Vol 33, No 10, Oct 58, p 31

"At present the first lot of methane refrigerator trucks is being built at Moscow on the basis of GAZ-51 vehicles. The gas cylinder automotive vehicles ZIL-156 and GAZ-51B, which operate on compressed natural gas, and the vehicles ZIL-156A and GAZ-51Zh, which are adapted to the use of liquefied gas, are already being supplied."

[For additional information on the chemistry and technology of fuels and propellants, see Item No 32.]

Chemistry and Technology of Nuclear Fuels and Reactor Construction Materials

7. Reports Related to Nuclear Energy Developments Given at the 50th Anniversary Congress of the Association of Hungarian Chemists (Budapest, 12-19 May 1958)

"Quantitative Determination of Uranium by a Procedure Involving the Use of a Complex-Forming Agent and an Ion Exchange Resin," by M. Fodor, Central Physics Research Institute, Hungarian Academy of Sciences; Budapest, Magyar Kemiai Folyoirat, Vol 64, No 7-8, Jul-Aug 58, pp 229-230

A method for the determination of uranium in ores was developed. This method, which involves the use of a complex-forming agent and of an ion-exchange procedure, is based on the following principle:

> Most of the accompanying elements which interfere with the quantitative determination of uranium or make this determination impossible are converted at $^{p}H = 7$ into a salt of the complex-forming agent. Then these elements are separated from uranium on an acidic ion-exchanger (Amberlite IRC-50). The adsorbed uranium is thereon eluted, reduced, and titrated oxidometrically. This procedure was found to yield satisfactory results in the analysis of some types of ore. A great advantage of this procedure is that separation by means of it can be carried out in a relatively short time.

"Data Pertaining to the Chromatography of Thorium," by G. Almassy, M. Ordogh, and B. Hadobas, Chemical Department of the Experimental Atomic Reactor, Central Physics Research Institute, Hungarian Academy of Sciences; Budapest, Magyar Kemiai Folyoirat, Vol 64, No 7-8, Jul-Aug 58, pp 240-241

Experimental conditions pertaining to the separation of thorium in cellulose columns and by paper chromatography were investigated. It was established that ether-nitric acid has certain shortcomings as a nonaqueous solvent. By using empirical equations, the assumption was confirmed that discontinuties in the spots or stripes produced by the nonaqueous solvent are due to an isotherm of the Freundlich type.

A solvent possessing optimum properties was prepared for the separation. This solvent is prepared in the following manner: After 8 milliliters of 1 N nitric acid have been shaken for 10 minutes with 10 milliliters of ether, the two phases which form after standing are separated and the upper (organic) phase is used. If elution is carried out with this solvent, the R_f value for the separation of thorium by paper chromatography amounts to 0.9. To carry out separation in the column, a total quantity of only 100 milliliters of the solvent is required.

"Preparation of Carrier-Free Isotopes Ba-140 and La-140," by L. Imre and B. Toth, Department of Chemistry of the Central Physics Research Institute, Hungarian Academy of Sciences, Budapest, Magyar Kemiai Folyoirat, Vol 64, No 7-8, Jul-Aug 58, pp 266-267

A procedure based on the formation of mixed crystals is best suited for the separation of radioactive alkaline earth metal isotopes from solutions of irradiated uranium. This method is also the most advantageous for the separation of these isotopes from each other. The method in question is being applied for the preparation of the purest Ba-140 and La-140. While most investigators start with the analysis of equilibriums occurring in systems containing mixed crystals, principal attention in the investigation carried out in this instance was paid to kinetic relationships pertaining to the formation of such crystals.

In the application of the method described, Ba-140 was first separated from the irradiated uranium with the aid of a lead sulfate carrier. After this, the lead sulfate was dissolved, the lead separated in the form of chloride and hydroxide, the small quantity of ammonium salts that had formed removed by sublimation, and the residue dissolved in very pure water. The precipitation of the lead sulfate can be conducted in such a manner as far as the rate of formation of crystallization nuclei is concerned that other alkaline earth metal isotopes which may be present do not precipitate.

From the solution of Ba-140 prepared in this manner, radioactive La-140 can be also isolated in a carrier-free state and deposited electrolytically with a very good yield.

"Enrichment of B-10 by Chemical Exchange," by I. Kiss and I. Opauszki, Department of Chemistry of the Central Physics Research Institute, Hungarian Academy of Sciences; Budapest, Magyar Kemiai Folyoirat, Vol 64, No 7-8, Jul-Aug 58, pp 267-269

The enrichment of B-10 by chemical exchange has been studied under dynamic conditions in two different experimental setups with different liquid addition compounds of BF_3. Estimation of the B-10 content has been effected by measuring the slow neutron absorption of the samples.

8. The Structure of Uranium-Oxygen Complexes

"The Constitution of Polynuclear Double-Charge Uranium-Oxygen Complexes and Their Arrangement in the Water Solution Structure," by I. I. Lipilina, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 122, No 2, 11 Sep 58, pp 238-241

The structure of positive (uranyl cations) and negative (uranate anions) uranium-oxygen complexes formed in solutions at different p_H values is discussed.

9. Book on Liquid Metal Reactor Coolants

Zhidkometallicheskiye Teplonositeli (Liquid Metal Heat-Transfer Agents), by S. S. Kutateladze, V. M. Borishanskiy, I. I. Novikov, and O. S. Fedynskiy, Atomizdat, Moscow, 1958, 200 pp (Supplement No 2 to Atomnaya Energiya, 1958)

According to the editors' preface, the second supplement to Atomnaya Energiya, 1958, deals with problems pertaining to the use of liquid metal heat-transfer agents in nuclear engineering. The book gives a systematic treatment to a great number of collated data on heat transfer from liquid metals obtained during the past 10 years in work done both in the USSR and outside the USSR in connection with the study of problems of nuclear power engineering. Although the book does not give an exhaustive treatment of the subject, it will in the opinion of the editors be useful in its present form to scientists and engineers active in the field of reactor designing and nuclear engineering and to persons active in other fields of technology in which liquid metal heat-transfer agents are used.

The principal parts of the book were written by S. S. Kutateladze, V. M. Borishanskiy, and I. I. Novikov; Chapters I, III, V, and VIII were written in collaboration with O. S. Fedynskiy. G. M. Lyamkin, N. A. Prikhodchenko, and Yu. I. Koryakin participated in the preparation of the manuscript for publication.

The text of the book is arranged as follows (cf. Table of Contents, p 4): Chapter I, Principal Characteristics of Liquid Metals (p 7); Chapter II, Fields of the Application of Liquid Metal Heat-Transfer Agents (p 23); Chapter III, Hydraulic Resistance During the Flow of Liquid Metals (p 27); Chapter IV, Turbulent Heat Transfer in Liquid Metals (p 38); Chapter V, Heat Transfer During Flow in Tubes (p 47); Chapter VI, Heat Transfer During Lengthwise Flow Around Plates (p 96); Chapter VII, Heat Transfer During Transverse Flow Around Cylinders (p 112); Chapter VIII, Heat Transfer During Free Convection (p 118); Chapter IX, Heat Transfer as a Result of the Condensation of Vapor (p 129); Chapter X, Heat Transfer During Boiling (p 138); Chapter XI, Heat Exchangers (p 162); Chapter XII, The Stability of Heat-Resistant Materials Toward Liquid Metals (p 171); Chapter XIII, Measuring Instruments (p 190); Bibliography (pp 203-205).

Chapter I discusses the structure of liquid metals (mercury, sodium, potassium, lithium, bismuth, gallium, and lead); the principal physical characteristics of liquid metals, giving data on mercury, sodium, potassium, lithium, bismuth, tin, lead, sodium-potassium alloy (25% sodium + 75% potassium), and lead-bismuth alloy (44.5% lead + 55.5% bismuth); the theory of the thermodynamic similarity of actual substances; and application of the theory of thermodynamic similarity to the investigation of properties of liquid metals; experimental data on the velocity of the propagation of sound in liquid metals; and the calculation of the velocity of sound in liquid metals.

In Chapter II the advantages of liquid metal heat-transfer agents over other heat-transfer agents are discussed. Among these advantages the following are pointed out: the high heat-transfer coefficient of liquid metals; low pressure in the heat transfer circuit containing the metal; the low melting point of liquid metal heat-transfer agents, such as the sodium-potassium eutectic; and the low activity of liquid metal, specifically alkali metals, in producing corrosion of structural materials. The advantages from the thermodynamic standpoint of having a binary (two-cycle) system for the generation of steam are discussed in some detail. It is pointed out that the use of water as a reactor coolant necessitates operation at very high pressures and has the added disadvantage that water, has a higher cross section of neutron capture than metal heat-transfer agents (for instance, sodium). As a disadvantage of the use of liquid metals, the fact that they become radioactive is mentioned.

Chapter V, after a theoretical introduction, discusses experimental data on heat transfer to mercury and mercury-sodium amalgam, lead-bismuth eutectic, tin, sodium, and sodium-potassium eutectic.

In Chapter IX, conditions arising during the condensation of mercury vapor and sodium vapor are considered.

Chapter X considers the boiling of mercury, magnesium amalgams, cadmium, sodium-potassium alloy, and sodium.

Chapter XII gives a large amount of data concerning the action of liquid metals (mercury, sodium, sodium-potassium alloy, bismuth, lead, and lead-bismuth alloys) on structural materials. Extensive data obtained in USSR work in regard to the action of mercury on steel are listed. The action of pure mercury is compared with that of mercury containing magnesium and titanium.

The bibliography at the end of the book consists of 41 USSR and 40 non-USSR references.

10. Iodide Refining of Niobium

"The Production and Properties of Iodide Niobium," by D. M. Chizhikov and A. M. Grin'ko, Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 122, No 2, 11 Sep 58, pp 278-279

Results obtained in an investigation of properties, conditions of formation, and decomposition of niobium iodides are reported. A procedure for the deposition of metallic niobium in the form of rods by the diproportionation of NbI_3 at 700-800° is described. It is stated that this procedure is also suitable for plating with niobium. The investigation in question was carried out at the Laboratory of Nonferrous and Rare Metals. The advantages of refining high-melting metals over their halides, specifically their iodides, are pointed out.

[For additional information on the chemistry and technology of nuclear fuels and reactor construction materials, see Item No 77.]

11. Possibilities of Synthesizing Heat-Resistant Polymers of the Multinuclear Aromatic Compound Type

"Concerning Some Characteristics of Multinuclear Aromatic Compounds and the Synthesis of Heat-Resistant Polymers," by A. A. Berlin and V. P. Parini, Laboratory of High-Molecular Compounds, Moscow Technological Institute of Meat and Dairy Production, and Laboratory of General Chemistry, All-Union Correspondence Institute of the Textile and Light Industry; Ivanovo, Izvestiya Vyashikh Uchebnykh Zavedenyy-Khimiya i Khimicheskaya Tekhnologiya, No 4, Sep 58, pp 122-127

The rapid development of aviation and rocket technology puts increased demands to polymer materials, particularly as far as stability at high temperatures is concerned. Theoretical considerations and data published in the literature indicate that high-molecular compounds consisting of a great number of aromatic nuclei (e.g., polyphenylenes, condensed rings arranged linearly or in planes, polyaromatic compounds forming a tridimensional structure) and possessing large numbers of metallic covalent bonds must have high melting points and exhibit exceptionally high heat resistance.

It would be advisable to investigate the possibilities of synthesizing polymers of this class. To study some of the properties of polyphenylenes, a high-molecular polymer was prepared by the desamination of benzidine -- also a water-soluble analog of this polymer by desaminating benzidine-3,3'-dicarboxylic acid. The high-molecular product containing carboxylic acid groups could be decarboxylated by heating and thus converted into a polyphenylene.

12. A. A. Korotkov's Work on Synthetic Elastomers and Polybutadiene Rubber Stable at Low Temperatures

"Election of Academicians and Corresponding Members of the Academy of Sciences USSR" (unsigned article); Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk; No 9, Sep 58, pp 1135-1154

A. A. Korotkov is a prominent scientist engaged in work in the field of the chemistry of high-molecular compounds. He participated actively in the organization of the production of synthetic rubber. Furthermore, he developed an industrial method for the oxidation of ethylene to ethylene oxide, conducted investigations on the industrial synthesis of a number of products derived from ethylene oxide, and has done work on the separation of ethylene from the waste gases of synthetic rubber production. Under Korotkov's direction work has been done on the improvement of the methods for treating by-products of the synthetic rubber production (viz., higher alcohols and hydrocarbons), on the synthesis of ethylene cynanohydrin, on the synthesis of acrylic acid nitrile, etc. Systematic investigations by him on the polymerization of diethylene and vinyl compounds with the aid of organic compounds derived from alkali metals and functioning as catalysts led to important theoretical results: the nature of the effect exerted by the organic radical in lithium-organic compounds on the velocity of polymerization reactions was established; the effect exerted by complex-forming compounds on the direction which the polymerization of isoprene and butadiene takes was discovered; the dependence of the constants of the copolymerization reaction on the nature of the metal in the organometallic compounds and on the nature of the solvent was clarified; and the kinetics of the polymerization of butadiene, isoprene, diisopropenyl, and styrene under the effect of organometallic compounds were investigated.

Korotkov developed a method for the polymerization of butadiene in equipment designed for continuous operation. The elastomer obtained has a high stability at low temperatures and is distinguished by a high degree of regularity in its microstructure. A great achievement of Korotkov is the synthesis of polyisoprene rubber accomplished by him. This rubber is close in its characteristics to natural rubber. He developed the technology of the production of polyisoprene rubber and was responsible for the production of more than 100 tons of this elastomer. Recently, Korotkov has begun research on the mechanism of the action of new catalysts based on halides of metals with changeable valency and organometallic compounds.

At a general meeting of the Academy of Sciences USSR held on 20 June 1958, A. A. Korotkov's election as Corresponding Member of the Academy of Sciences USSR in the specialized field of chemistry of high-molecular compounds by the Department of Chemical Sciences was confirmed.

13. B. A. Dolgoplosk's Investigations in the Field of High-Molecular Compounds

"Election of Academicians and Corresponding Members of the Academy of Sciences USSR" (unsigned article); Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk: No 9, Sep 58, pp 1135-1154

B. A. Dolgoplosk is a prominent investigator in the field of organic chemistry and the chemistry of high-molecular compounds. Dogoplosk's scientific work deals primarily with the investigation of the mechanism of polymerization processes, the inhibition of radical processes, and the synthesis of new types of elastomers. A group of his investigations in the chemistry of polymers pertains to the study of the redox inhibition of radical processes. The results of his work on the activating effect exerted by different reducing agents on the process of decomposition of diazoaminobenzene and polymerization processes were introduced into industrial application, specifically as far as the emulsion polymerization of butadiene is concerned. Dolgoplosk received a Stalin Prize for his work in this field.

Dolgoplosk has carried out a number of investigations on the synthesis of new polymers and correlations between the structure of polymers and their properties. Much of the work done by him was applied at sythetic rubber plants. Systematic investigation of the phenomenon of redox initiation led him to the development and investigation of new systems capable of initiating radical processes at low temperatures. The theoretical research by Dolgoplosk, which has been summarized in the monograph Issledovaniya v Oblasti Polimerizatsii (Investigations in the Field of Polymerization), resulted in the award of a Stalin Prize to him in 1945. He has carried out a number of investigations on the reactions of free radicals in solutions.

The inhibition of radical reactions was investigated by Dolgoplosk on processes of thermal and initiated polymerization, the oxidation of hydrocarbons and the decomposition of peroxides. During recent years, Dolgoplosk has done extensive work on catalytic polymerization. With the use of the catalytic method of polymerization, solid heat-resistant polymers of butadiene and isoprene have been synthesized which exhibit high softening points.

At a general meeting of the Academy of Sciences USSR held on 20 June 1958, the election of Dolgoplosk as Corresponding Member of the Academy of Sciences USSR by the Department of the Chemical Sciences in the specialized branch of the chemistry of high-molecular compounds was confirmed.

14. S. S. Medvedev's Work on High-Molecular Compounds and Applications of Radiation in Polymerization Reactions

"Election of Academicians and Corresponding Members of the Academy of Sciences USSR" (unsigned article); Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk; No 9, Sep 58, pp 1135-1154

S. S. Medvedev is one of the leading scientists active in the field of the chemistry of high-molecular compounds. He is especially well known because of his research on polymerization processes. Medvedev has developed a theory of polymerization processes which is applied successfully in the solution of a number of practical problems pertaining to the production of plastics and elastomers. As a result of the investigation of a great number of polymerization processes, Medvedev established for the first time that many reactions of this type are chain processes which take place with the participation of free radicals. Detailed study of diverse interactions of free radicals with substances present in polymerization media or formed in such media led to the clarification of the mechanism of the processes which take place with the result that it became possible to control radical polymerizations and the characteristics of the polymers formed in reactions of this type. Medvedev's work on emulsion polymerization is of major scientific and practical importance. As a result of this work, new concepts were formulated in regard to the mechanism of the processes involved. General laws could thus be established which explain the experimental relationships observed. Very interesting is Medvedev's research on ionic polymerization. Medvedev synthesized for the first time new elastic materials which have a high heat resistance.

New and valuable results were obtained by Medvedev in the field of radiation chemistry. He found methods for effective radiation-chemical polymerization of ethylene resulting in the formation of crystalline polyethylene. Specific characteristics of the cross-linking of polymer chains under the action of nuclear radiation were investigated. The nature of the action of radiation on multicomponent systems was studied. It was established in this work that the effect produced is due to a redistribution of the radiation energy originally absorbed as a result of primary action of radiation. Work by Medvedev on the thermo-oxidative decomposition of polymers with the purpose of their stabilization is proceeding successfully.

The work by Medvedev and his pupils is exerting a great influence on the development of the theory of chemical kinetics of chain processes. Medvedev has published nearly 100 scientific works. His research in the field of polymerization processes has been recognized by the award of a Stalin Prize.

At a general meeting of the Academy of Sciences USSR held on 20 June 1958, S. S. Medvedev was elected Academician in the Department of Chemical Sciences within the specialized branch of chemistry of high-molecular compounds.

Inorganic Chemistry

15. A. V. Nikolayev's Work on Natural Salts, Borates, and Rare-Earth Elements

"Election of Academicians and Corresponding Members of the Academy of Sciences USSR," (unsigned article); Moscow, Izvestiya Akademii Nauk SSR, Otdeleniye Khimicheskikh Nauk; No 9, Sep 58, pp 1135-1154

A. V. Nikolayev is a prominent investigator in the field of inorganic chemistry. He has published more than 100 scientific articles and a number of monographs on natural salts, thermography, and radiochemistry. The principal scientific work done by Nikolayev deals with the physicochemical analysis of salt systems with the purpose of clarifying the conditions under which natural salts have formed and of developing ways for their conversion and industrial utilization. During a number of years, he studied the salt deposits of Western Siberia and Kazakhstan and the salts of the Kulundisk and Pavlodar salt lakes and of the Lake Kuchuk. Nikolayev is responsible for outstanding investigations of the Inder borates, the results of which are described in the monograph Fiziko-Khimicheskoye Izucheniye Prirodnykh Boratov (Physicochemical Investigation of Natural Borates). Nikolayev contributed to the development, improvement, and extensive application of thermography, specifically in the field of the complex compounds of platinum. Together with his collaborators he published the monograph Termografiya, Yeye Metod i Praktika (Thermography, Its Methods and Practical Applications) and the collection of articles Zashchitnyye Plenki Na Solyakh (Protective Films on Salts), which contains new data on the formation of films on the surface of salts and proposals concerning the application of such films. The most important work done by Nikolayev in recent years consisted of research on the chemistry and separation of rare-earth elements. The results of this work have been introduced into industrial application. He also carried out a large number of investigations on the extraction of inorganic substances with organic solvents.

At a general meeting of the Academy of Sciences USSR held 24-28 March 1958, A. V. Nikolayev's election as Corresponding Member of the Academy of Sciences USSR by the Siberian Affiliate of the academy in the specialized branch of chemistry was confirmed.

16. Derivatives of Unsaturated Phosphinic Acids Investigated

"Investigations in the Field of Derivatives of Unsaturated Phosphinic Acids. Report 21, Esters and Amides of Beta-isooctyloxyvinylphosphinic Acid," by K. N. Anisimov and B. V. Raysbaum, Institute of Elemento-Organic Compounds, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniya, Khimicheskikh Nauk, No 10, Oct 58, pp 1208-1211

The following compounds were synthesized and characterized: the acid chloride of beta-isooctyloxyvinylphophinic acid, the diethyl, dipropyl, dibutyl, diisobutyl, diisoamyl, dihexyl, diisooctyl, dimethoxyethyl, diethoxyethyl esters of beta-isooctyloxyvinylphosphinic acid and the tetramethyldiamide, tetraethyldiamide and "dipiperidide" of beta-isooctyloxyvinylphosphinic acid.

17. Investigations Involving Some Organic Phosphites

"Beta-Ethylmercaptoethylphosphites and Some of Their Properties," by T. Ya. Medved' and M. I. Kabachnik, Institute of Elemento Organic Compounds, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 10, 16 Oct 58, pp 1212-1218

Di-beta-ethylmercaptoethylphosphite, ethyl-beta-ethylmercaptoethylphosphite, and tri-beta-ethylmercaptoethylphosphite were synthesized and characterized.

Di-beta-ethylmercaptoethylphosphite possesses the well-known properties of dialkylphosphites; it forms Na derivatives which can react with sulfur, and can enter into the Mikhaelis-Baker reaction. Di-beta-ethylmercaptoethylphosphite reacts with ketones and ammonia forming esters of alpha-aminoalkylphosphinic acids, and combines with aldehydes forming esters of oxyalkylphosphinic acids.

With the Arbuzov rearrangement, tri-beta-ethylmercaptoethylphosphite, by the action of methyl iodide, forms the di-beta-ethylmercaptoethyl ester of methylphosphinic acid.

18. New Method for Synthesizing Trialkylphosphites

"In the Field of Organic Insectofungecides, XXXIV. A New Method for Synthesizing Trialkylphosphites," by N. N. Mel'nikov, Ya. A. Mandek'baum, and Z. M. Bakanova; Moscow, Zhurnal Obshchey Khimii, Vol 28 (90), No 9, Sep 58, pp 2473-2474

Although trialkylphosphites are valuable raw materials for the production of insectofungecides, none of the four methods at present described in the literature (the A. Ye. Arbuzov method, the Milobendski method, and the methods described by G. M. Kosolapoff and V. I. Kovalenko) gives sufficient product yield. Therefore, the author presents the following method which gives a 35-60% yield of trialkylphosphite:

$$2PCl_3 + (RO)_2Mg \rightarrow 2ROPCl_2 + MgCl_2$$
$$2ROPCl_2 + (RO)_2Mg \rightarrow 2(RO)_2PCl + MgCl_2$$
$$2(RO)_2PCl + (RO)_2Mg \rightarrow 2(RO)_3P + MgCl_2$$

19. Analogous Behavior of Halogen Derivatives of β-Disulfones and β-Diketones

"The Analogous Behavior of Halogen Derivatives of β-Disulfones and β-Diketones," by B. A. Arbuzov and N. P. Bogonostseva, Zinatn. raksti. Latv Univ., Uchennyye Zapiski Latviskogo Universiteta (Scientific Notes of the Latvian University), Vol 15, 1957, pp 67-71 (from Referativnyy Zhurnal--Khimiya, No 17, 10 Sep 58, Abstract No 57514 by G. Motsarev)

$(C_2H_5SO_2)_2CX_2$ (I) where X = Cl or Br reacts with $NaOP(OC_2H_5)_2$ and $P(OC_2H_5)_3$ (II) analogously to the halogen derivatives of β-diketones with the formation of $(C_2H_5SO_2)_2CH_2$. By the interaction of (I) with (II) $(C_2H_5SO_2)_2CHC_2H_5$ is also formed.

20. Research on Insecticides

"The Insecticidal Properties of Certain Organophosphorus Compounds," by D. M. Paykin, M. P. Shabanova, N. M. Gamper, and L. F. Yefimova, Khimiya i Primeneniye Fosfororgan. Soyedineniye (The Chemistry and Application of Organophosphorus Compounds), Moscow, Academy of Sciences USSR, 1957, pp 408-419 (from Referativnyy Zhurnal -- Khimiya, No 20, 25 Oct 58, Abstract No 68554 by A. Grapov)

"With a concentration of 0.05%, 95-100% fatality among eurygasters was produced by 2,4,5-trichlorphenyldiethyl-, 3-ethoxyphenyldimethyl-,, beta-chlorethyldi-(p-nitrophenyl)-, 3-propoxyphenyldipropyl-, and ethyl-bis-(2-chlor-4-nitrophenyl)-thiophosphates, and 3-propoxyphenyldiethyl- and beta-chlorethyl-bis-(para-nitrophenyl)-phosphates. The o, o-diethylcarbomethoxy- and carboethoxythionophophates produce 95-100% fatality among eurygasters with a concentration of 0.3%, and 95-100% fatality among parasitic Coccidae with a concentration of 0.005%. Thiophosphorous acids and esters of aminophosphinic and aminothiophosphinic acids are weak insecticides. Among the esters of thiono- and thiolphosphinic acids the most active are the o-methyl and o-ethyl-o-p-nitrophenylmethylthionophosphonates and o-ethyl-S-(beta-ethyl-mercaptoethyl)-dithiophosphate (I). The o,o-diethyl-S-(beta-ethylmercaptoethyl)- dithiophosphate (II) produces 95-100% fatality among Coccidea and eurygasters in concentrations of 0.005 and 0.0005%; its dimethyl analog (III) -- in concentrations of approximately 0.025 and (greater than 0.0005%, and o,o-dimethyl- S-(beta-methylmercaptoethyl)-dithiophosphate (IV) -- 0.015 and greater than 0.0005%. Investigations of the intraplant action after presowing treatment of seeds by a 0.6% solution indicated that (I) and $C_2H_5O(C_2H_5)P(O)SCH_3$ produces 77.5% fatality among VR for 7 days, and (III), (IV) and mercaptophos -- 85-, 82.5-, 87.5-, and 60% fatality. (II) possesses systemic action on biting insects. The first stage larva of the Italian grasshopper died at the rate of 52.8% and 100% after being fed for 17 days on wheat shoots obtained from seeds treated by 0.05 and 0.02% solutions."

21. Dimerization of 1-methyl 1-cyclohexene

"Study of the Mechanism of Several Reaction by Means of Hydrogen Exchange," by D. N. Kursanov, V. N. Setkina, S. V. Vitt, and Z. N. Parnes, Problemy Kinetiki i kataliza, Vol 9, 1957, pp 242-244 and 274-280 (from Referativnyy Zhurnal -- Khimiya, No 17, 10 Sep 58, Abstract No 57314 by M. Vol'pin)

Cf, Referativnyy Zhurnal -- Khimiya, 1957, Abstracts No 11574, 63390; 1958, Abstracts No 14311, 14312. It was also shown that the dimerization of 1-metyl 1-cyclohexene under the effect of deuterophosphoric acid proceeds through a stage of carbonium ion formation.

22. Increasing the Yield and Stabilization of Furfural

"On Increasing the Yield and Stabilization of Furfural, a Raw Material for Substitutes of Sulfonamides and Antibiotics," by A. A. Shcherbakov, Sb. nauchn. tr. Vinnitsk. gos. med. in-ta, Vol 8, 1957, pp 84-91 (from Referativnyy Zhurnal -- Khimiya, Vol 17, 10 Sep 58, Abstract No 58411 by L. Mikhel'son)

"To increase the yield of furfural (1) the author proposes the preliminary processing of the raw material to be hydrolized: oat chaff, buckwheat husks, and rapeseed wastes are treated with $(CH_2Cl)_2$, CCl_4 and solar oil. By this method the yield of (1) is increased on the average after 24 hours of treatment, by 3.1% on the basis of the air-dried raw material or by 49% with relation to the (1) obtainable in the absence of the mentioned solvents. After half-hourly treatment of the raw material with solvents, the yield increased by 2.6 and 34%, respectively. Continuous treatment for more than 24 hours effected little increase in the yield of (1). For storing (1) for long periods, the following substances which are added at the rate of 0.1% by weight of (1), appear as stabilizers: amides, Na- and Ca- salts of acids of the aliphatic series, oxy- and nitrogen-containing derivatives of aromatic hydrocarbons, organic solvents, and carbohydrates. Although alkaloids likewise increase the stability of (1), they nevertheless are of no practical value. Acids of the aliphatic and aromatic series and heavy metal salts decrease the stability of (1).

23a. N. M. Emanuel's Work on the Kinetics of Oxidation Reactions

"Election of Academicians and Corresponding Members of the Academy of Sciences USSR (unsigned article); Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk; No 9, Sep 58, pp 1135-1154

N. M. Emanuel' is one of the leading researchers in the field of chemical kinetics. He is the author of more than 80 published works on problems pertaining to the experimental confirmation of the chain theory, the investigation of the mechanism of homogeneous catalysis and chemical induction, and the development of new methods for the stimulation of slow branched-chain reactions and the control of processes based on them. A great number of investigations done by Emanuel' deals with the study of intermediate products of oxidation. He was the first to establish the formation of intermediate products of the free-radical type in the course of slow branched-chain reactions. In this work Emanuel' investigated the kinetic behavior of the intermediate products that are formed and developed methods for their spectroscopic identification. He confirmed the important conclusion of the chain theory concerning the formation of high concentrations of active centers in the course of branched-chain reactions. Emanuel developed an original kinetic method for the investigation of intermediate products which makes it possible to study their kinetic behavior during the course of the process that takes place.

Emanuel' discovered a new mechanism of homogeneous catalysis which is operative in reactions of the oxidation of hydrocarbons. He showed that homogeneous catalysis is realized by a succession of two chain reactions separated in time which are distinguished by different mechanisms. He proposed a new principle of gas initiation for branched-chain reactions of the oxidation of organic substances in the liquid phase. In this type of initiation, the initiating effect is exerted only during the starting period of the development of the reaction. Emanuel' formulated the general problem of the transfer of many oxidation processes taking place in the gas phase from conditions corresponding to high-temperature gas oxidation to conditions of mild low-temperature oxidation in the liquid phase with the utilization of the principle of gas initiation. This work is very promising from the standpoint of applications in the chemical industry. In 1958, Emanuel' was awarded a Lenin Prize for his work in the field of chain reactions.

At a general meeting of the Academy of Sciences USSR on 20 June 1958, the election of N. M. Emanuel' as Corresponding Member of the Academy of Sciences USSR in the specialized branch of physical chemistry by the Department of Chemical Sciences was confirmed.

23b. The Effect of Impurities on Chemical Bonding of Aluminum

"Present-Day Ideas in Regard to Aspects of Bonding Which Influence the Physical and Chemical Characteristics of Pure Aluminum Containing Different Impurities," by K. R. Vassel, Metal Industry Institute at Budapest; Budapest, Magyar Kemiai Folyoirat, Vol 64, No 7-8, Jul-Aug 58, pp 262-263

Classical concepts in regard to the number of bonding electrons do not suffice to explain the electric conductivity and chemical inertness characteristics which reflect conditions pertaining to chemical bonding in pure aluminum and on the surface of aluminum. Present-day theoretical views on the subject take into consideration the structure and degree of filling of electron shells. In the case of aluminum a number of bonding electrons amounting to 3 and to 1.2-1.3 is obtained. This is in agreement with theory and experimental results.

(This paper was presented at the 50th Anniversary Congress of the Association of Hungarian Chemists held at Budapest 12-19 May 1958.)

Miscellaneous

24. Martin Izrailevich Kabachnik

"Elections of Academicians and Corresponding Members of the Academy of Sciences USSR" (unsigned article); Moscow, Izvestiya Akademii Nauk SSSR Otdeleniye Khimicheskikh Nauk, No 9, Sep 58, pp 1138-1149

According to this report, Martin Izrailevich Kabachnik was elected Academician of the Academy of Sciences USSR during the elections held 16-20 June 1958. His specialization is organic chemistry.

M. I. Kabacknik is one of the greatest Soviet organic chemists, known for his investigations in the field of theoretical organic chemistry and the chemistry of organophosphorus compounds: the author of more than 170 scientific works. The labors of M. I. Kabachnik in organic chemistry were devoted to the study of problems of tautomerism and double reaction processes. He developed the quantitative theory of tautomeric equilibrium, as in the protolithic acid-base equilibrium. The application of this theory to solve definite problems of tautomerism and problems in the chemistry of tautomeric substances has given important results. Problems were solved involving the acidic properties of separate ketone and enol forms, the influence of this acidity on the equilibrium state, and the role of the solvent. He issued the theoretical result of earlier known empirical formulas; he developed new potentiometric and calorimetric methods of determining the tautomeric equilibrium constant. Lately, Kabachnik has been systematically investigating the quantitative bond of the structure of tautomeric forms and the equilibrium state. M. I. Kabachnik's thoughts about the problem concerning the participation of both geometric enol isomers in the tautomeric keto-enol equilibrium are interesting.

The synthetic investigations of Martin Izrailevich Kabachnik in the field of organophosphus compounds were conducted for the purpose of finding new practical, important substances, namely, with physiological activity, and to devise new methods of synthesis. He found a series of new methods of synthesis for organophosphorus compounds and realized the synthesis of many new types of such substances. During the Patriotic War, Kabachnik accomplished a series of synthetic investigations for which he was awarded the Stalin Prize in 1946. Systematic investigations involving the synthesis of new organophosphorus insecticides, started by Kabachnik and his associates in 1953, produced new insecticides which were as active as those known previously, but which were less toxic to humans and animals. In this endeavor, over 200 new insecticides were studied and tested. One of these preparations, "M81", has been recommended for use in agriculture, and its manufacturing has begun.

Kabachnik completed many investigations in synthesizing and studying the properties of α-aminophosphinous acid. These labors led to the development of organophosphorus complexes which exhibit high complex forming capacity. In all, M. I. Kabachnik and his associates have synthesized over 700 new organophosphorus compounds, part of which have considerable practical interest.

25. Conference on High Polymers

"Conference of Chemists" (unsigned article); Moscow, Izvestiya, 30 Sep 58, p 1

"Yaroslavl' (29 September) -- A scientific technical conference convened by the Ministry of Higher Education USSR and the All-Union Chemical Society imeni Mendeleyev, was opened here today. The conference is dedicated to current problems in the chemical industry -- the synthesis of derivative products for producing high polymers.

Scientists of the Academy of Sciences USSR, the scientific research institutes, industry, academies of sciences of the union republics, and many higher teaching establishments, and scientific representatives from Czechoslovakia are participating in the conference.

Fifty-one reports were presented. Among these are the report of A. N. Nesmeyanov, president of the Academy of Sciences USSR; A. V. Topchiyev, vice-president of the Academy of Sciences; Yu. G. Mamedaliyev, president of the Academy of Sciences Azerbaydzhan SSR; and other prominent scientists."

26. Institute of Shales Organized in Kokhtla-Yarve, Estonian SSR

"Institute of Shales Has Begun to Operate" (unsigned article); Tallin, Sovetskaya Estoniya, 6 Sep 58, p 2

An Institute of Shales (Institut Slantsev) [Scientific Research Institute for Mining and Processing of Shale (Nauchno-Issledovatel'skiy Institut po Dobyche i Pererabotke Slantsev)] has been organized in Kokhtla-Yare, Estonian SSR. Ye. F. Petukhov, the director, claims that the institute will conduct theoretical research on the problem of mining and processing shale. The institute has had transferred to it the laboratories, equipment, and top personnel of the former All-Union Scientific Research Institute of Processing Shale, located in Leningrad.

VI. ELECTRONICS

Communications

27. Advantages of Exponential Detectors

"Simultaneous Detection of Signal, Undamped Interference, and Fluctuating Noise With Exponential Detector," by M. S. Nemirovskiy; Moscow, Elektrosvyaz', No 11, Nov 58, pp 9-17

The article analyzes the performance of an exponential detector for cases of low intensity signal and fluctuating noise and for all intensities of undamped interference.

When the frequency difference between the signal and interference is such that the resulting beat frequency falls outside the bandpass of the filter, then the detrimental effect due to the increased fluctuating noise from the beat frequency of undamped interference and noise becomes noticeable. This undesirable effect can be greatly reduced by utilizing nonlinear elements with appropriate characteristics, such as exponential detectors, which are superior in many respects to conventional linear and quadratic detectors. In an exponential detector the signal-to-noise ratio approaches a certain finite limit, below which it does not fall irrespective of the magnitude of interference.

The performance of exponential detectors was initially studied by the Soviet scientists Ye. G. Momot, A. G. Bakanov, and A. D. Knyazev.

28. Modern Television Transmitters

"Constructional Features of Modern Television Transmitters," by A. I. Lebedev-Kramanov; Moscow, Elektrosvyaz', No 11, Nov 58, pp 36-44

The article discusses in general the modern trends of television transmitter design in the USSR and abroad. The article contains the following passages:

"Favorable results are expected from utilization of the new method proposed in the USSR for feeding dipoles of a television array antenna, which will assure multiple compensation of reflections from the antenna. Methods of pre-emphasis in auxiliary circuits by means of suitable distortion of transient characteristic of the preceeding video channel are also examined. However, the highest hopes are centered on the USSR proposal for construction of the output stage of TV transmitters with a special echo-absorption circuit. The mentioned stage is divided into two equal independent

units which are excited with a phase shift of 90°, and are afterward combined with an inverse propagation difference of a quarter wave in a bridge-type device. It is easy to see that, if a reflected signal from an antenna will arrive at such a circuit, it will be fully absorbed in the ballast resistor of the bridge. Utilization of such layout is especially convenient in the design of transmitters on the principle of power additions [combinations]; in such a case practically no additional equipment is required."

"It should be noted that for the conditions existing in the USSR, where the manufacture of TV broadcasting stations is attaining a series scale of production, the problem of rational selection of power capacity of component units has acquired great practical significance. Of course, the most important achievement would be the building of an efficient broadcasting network. If this could be combined with a reasonably small number of types of transmitters in use, a substantial economy in manufacturing could be achieved."

Computers and Automation

29. New Digital Automatic Compensator Described

"Concerning a Digital Automatic Compensator Having a Binary-Decimal Scale," by G. V. Der-sharts and K. A. Netrebenko; Moscow, Priborostroyeniye, No 9, Sep 58, pp 7-9

The introduction to the article follows.

"In recent years several constructions for automatic potentiometers with discrete scales, sometimes called digital voltmeters, have been developed.

"In our work a digital automatic compensator is described in which a binary-decimal compensating device is used and in which all the switches in the measuring circuits are actuated by standard electromechanical relays, (see the work by K. A. Netrebenko, An Automatic Potentiometer of Discrete Action, Patent No 112850, effective since 26 February 1957, Avtomaticheskiy potentsiometer diskretnogo deystviya, Avtorskoye svidetel'stvo No 112850, prioritet ot 26/II 1957). The apparatus is adapted for work with a device printing the result by decimal digits on paper tape."

30. Scale Linearization for Automatic Control Devices

"Concerning a Rational Method of Linearizing the Scales of Automatic Control Devices, by L. A. Voronkov; Moscow, Priborostroyenoye, No 9, Sep 58, pp 12-15

Automatic compensating control devices are extensively used in technology for the measuring and recording of small voltages and the electromotive force of a direct current generated by different transducers. These devices find especially wide industrial application for the measurement and recording of various nonelectrical quantities transformed into electrical quantities by transducers.

Often, the automatic compensating devices of balancing operate in a set with transducer having nonlinear characteristics. In this case the scale of the device is also nonlinear, which is inadmissible for a series of cases. Thus, for example, on summing, for distant transmission of readings and especially during utilization of automatic devices in a number of measuring transformers of nonelectric quantities into standard electrical quantities it is necessary to have a nonlinear dependence between the measured nonelectrical and the reading device or the voltage of the transducer. For that reason in the past linearized scales have been widely utilized for automatic devices.

The present work is devoted to an analysis of the errors and the choice of greatest rational parameters of the automatic set devices of balancing during linearization of the scales.

Instruments and Equipment

31. Instrument for Measurement of Extra-Large Resistances

"Method and Instruments for Measuring Resistance up to 10^{14} Ohms," by G. F. Pankratov and T. B. Rozhdestvenskaya; Moscow, Izmeritel'naya Tekhnika, No 5, Sep-Oct 58, pp 47-50

Recently, at the All-Union Scientific Research Institute of Metrology imeni D. I. Mendeleyev (VNIIM), an instrument for measuring resistances up to 10^{14} ohms was designed. The operation of the instrument is based on discharge of a capacitor at constant potential.

The main components of the instrument are a measuring air capacitor of variable capacitance, nul indicator, power supply battery, and voltage divider. The UBS-1 instrument was designed by the authors of the article and L. S. Levin and S. Ya. Polyakov. The instrument was manufactured at the "Etalon" Plant. The accuracy of the instrument is in the range of 0.2-0.5%. High resistance standards of 10 x 10^8, 10 x 10^9, 10 x 10^{10}, and 10 x 10^{11} ohms were developed at the same time.

32. Magnetic Gas Analyzers for the Determination of Oxygen

"New Magnetic Gas Analyzers," by R. Sh. Perlovskiy and M. K. Yarmak; Moscow, Priborostroyeniye, No 9, Sep 58, pp 3-7

MGK-2 thermomagnetic gas analyzers with an annular chamber, which are supplied by the experimental Design Bureau of Automatics (OKBA), are suitable for indicating and controlling the oxygen content within the range from 0% to 40-50%. They are not suitable for use at higher concentrations of oxygen (particularly in the control of the purity of oxygen), because the sensitivity of the analyzer drops at higher concentrations. To make possible indication and control of the oxygen content in any gas mixtures and at any concentrations of oxygen, OKBA is developing magnetic gas analyzers of two types: MGK-3, an explosion-proof device for the determination of oxygen in multicomponent mixtures; and MGK-4, a device for the control of the purity of oxygen.

The thermomagnetic principle is not applicable to the analysis of oxygen in multicomponent systems: the operation of the MGK-3 device is based on differences in the resistance to the flow of gas in a magnetic field that are produced by changes in the oxygen content of the gas. The MGK-4 gas analyzer operates on the thermomagnetic principle and represents a modified MGK-2 device in which increased sensitivity in the range of high oxygen concentrations is achieved by directing a thermal convection flow against the thermomagnetic convection and thus reducing the latter, reducing the intensity of the magnetic field to decrease the thermomagnetic convection still further, and increasing the temperature of the spiral changes in the resistance of which measure the thermomagnetic flow.

The design of the analyzers mentioned above is described in detail. These analyzers are now undergoing industrial tests. The MGK-3 gas analyzer will be suppied with scales corresponding to 0-5, 0-10, 0-21, 0-50, and 15-45% of O_2 and the MGK-4 analyzer with scales for 95-100, 90-100, 80-100, 50-100, and 20-30% of O_2.

[For additional information on instruments and equipment, see Item No 59.]

Components

33. New Television Receiver

"News of Soviet Engineering -- New Televisor" (unsigned article); Moscow, Sovetskaya Aviatsiya, 31 Oct 58

Production of new 12-channel Soviet television receivers "Rubin-102" (table model) and "Rubin-202" (console model) has just begun. This is a modernized version of the previously manufactured "Rubin."

The over-all dimensions of the new set have been considerably reduced as below those of the older model. The new "Rubin" has phonograph and tape-recording attachments. It have five built-in loudspeakers which assure high-quality sound reproduction. The set has provisions for remote control of picture brightness and sound volume through a 5-m cable. Power consumption of the set has been reduced in the new model to 150 w.

34. Pulse Circulation in Highly Nonlinear System

"Pulse Circulation in Highly Nonlinear System With Dispersive Delay Feedback," by Yu. I. Neymark, Yu. K. Maklakov, and L. P. Yelkina, Institute of Radio Engineering and Electronics, Academy of Sciences USSR; Moscow, Radiotekhnika i Elektronika, No 11, Nov 58, pp 1348-1360.

The article discusses the processes connected with the circulation of pulses and groups of pulses in a highly nonlinear systems with delay feedback possessing considerable dispersion. The delay feedback oscillators with nonlinear, linear, and delay links are of considerable interest to radio engineers.

Theoretical investigation of systems with delay feedback were conducted in the following directions: investigation of linear systems with consideration for the linear link and the delay; investigation of relay system of automatic regulation, which permit the study of self-oscillations with a large time delay; investigation of weak nonlinear systems with delay feedback (generating near-sinusoidal oscillations) by the method of small parameters; and investigation of systems with delay feedback which can be described by an equation with delay argument in the form of $x(t)= \int [x(t-\alpha)]$.

Experimental investigation was conducted which succeeded in observing a three-pulse cycle for cases of equal spacing between the initial pulses.

35. Microwave Ferrite Amplifiers

"Problem of Building a Microwave Ferrite Amplifier," by A. L. Mikael'yan; Moscow, Radiotekhnika i Elektronika, No 11, Nov 58, pp 1323-1347

The article discusses the principles of construction of a new-type low-noise microwave amplifier utilizing a ferrite element as its basic component, and analyzes the phenomena on which the operation of such an oscillator and amplifier is based. The low level of noise in parametric ferrite amplifiers is explained by the fact that precession of electron spin is utilized here, rather than the free motion of electrons which is the source of noise. The ferrite amplifier should have about the same capabilities as a paramagnetic amplifier, but will be able to operate at normal temperature, while the paramagnetic amplifier can operate satisfactorily only at a very low temperature.

A ferrite oscillator is visualized as a device consisting of a resonant cavity inside of which is placed a ferrite element subjected to a steady magnetic field of proper intensity. An auxiliary oscillator is used to excite oscillation in the resonator. The ferrite element is mounted at the point of maximum intensity of the magnetic field. The frequency of oscillations modulates the parameters of the ferrite element; the amplitude of oscillations should exceed the threshold of excitation.

The theoretical study of the performance of the ferrite amplifier leads to a belief that such an amplifier will play an important role in microwave amplification and that practical and efficient units will be developed soon.

The author thanks M. L. Ter-Mikaelyan, V. I. Zubkov, and S. M. Rytova for the help offered in conducting this study.

36. Ferrite-Transistor Units

"Ferrite-Transistor Units in Control Circuits," by I. M. Shenbrot; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No 10, Oct 58, pp 18-26

The article discusses performance and application of ferrite-transistor units incorporating magnetic cores with rectangular hysteresis loop and type P1E transistors. These ferrite-transistor units are

used to generate pulses of specified power and prescribed width and leading-edge steepness. A pulse-generating unit fed from a 127-v, 50-cycle power source was designed which would generate 20-v square pulses of 400- to 600-microsec duration.

The ferrite-transistor units can be used as storage components, in which the core is magnetized by the entry and reading pulses. In the simplest form of storage unit two input windings are used; to one such winding the entry pulse is fed and to the other the reading pulse. Complete remagnetization of the core during a short reading pulse can be secured with the aid of strong positive feedback.

Recent improvement in the technology of ferrite cores permits the construction of ferrite-transistor storage units in which the positive emf induced in the winding is sufficiently small not to interfere with the transistor performance. Storage units are now being built with magnetic cores having a square-form factor of 0.93. Further significant expansion of the operating ranges of such ferrite-transistor units can be attained by incorporation of a second ferrite core into the circuit.

37. Universal Nuclear Magnetometer

"Universal Nuclear Magnetometer," by Yu. N. Denisov, Joint Institute for Nuclear Research; Moscow, Pribory i Tekhnika Eksperimenta, No 5, Sep Oct 58, pp 67-70

The article describes a device for measuring the intensity of a steady magnetic field which operates on the principle of nuclear resonance. An oscillator method is used for detection of resonance. The intensity range of the measured magnetic field was 300-20,000 oersteds. The permissible nonuniformity of the magnetic field in the proximity of the transducer should not exceed 4-5% of the measured value. The accuracy of measurements is about 0.01%. The measurements are taken practically at a "point," because the volume of the sample in which the nuclear resonance absorption is observed varies only from 0.002 to 0.01 cm^3, depending on the frequency range. A quarter-mole aqueous solution of $Fe_2(SO_4)$ was used for the sample.

In this device the oscillator detector of nuclear resonance absorption and the low-frequency preamplifier are mounted in the transducer, which can be placed directly into the gap of a magnet. This transducer construction permits measuring the intensity of the magnetic field of magnets of various shape and size. The vertical dimension of the transducer varies from 12 to 21 mm, depending on the intensity of the measured

magnetic field and the range covered. The transducer is connected to the device with three RK-19 high-frequency cables. The main unit of the device houses a low-frequency amplifier, control oscilloscope, phase detector, high-frequency oscillator for coarse measurements, and a power pack. The frequency range of the oscillator is 10-18 mc, which is subdivided into five subranges.

High precision and simplicity of operation make the device suitable for solution of a wide variety of problems connected with the study of magnetic fields.

38. Pulse-Modulated Quartz Oscillator

"Pulse-Modulated Quartz Oscillator" by V. V. Okorokov; Moscow, Pribory i Tekhnika Eksperimenta, No 5, Sep/Oct 58, pp 45-48

The article describes a pulse-modulated quartz oscillator which serves to build time-base scale relative to the extraneous trigger pulse. A quartz plate of one mc natural frequency served as the excited element of the oscillator. The sinusoidal oscillations of the impact-excited quartz plate were transformed after amplification into a finite series of narrow pulses at one-microsec intervals.

This type of oscillator was used in a long-period test of the effective quantity of secondary neutron emission from Pu^{239}, and was found to be quite stable. An analogous oscillator was used to measure the full effective cross section of fissionable on nonfissionable elements.

Miscellaneous

39. Recent Soviet Patents in Communications

"Authorship Certificates" (unsigned article); Moscow, Elektrosvyaz', No 11, Nov 58, p 78

Class $21a^1$, 7_{01}. No 112256 -- V. I. Kalashnikov; Method of Compensating an Electronic Regenerator and Electronic Start-Stop Regenerator to Accomplish Such Method

Class $21a^1$, 10_{01}. No 111363 -- G. F. Pramnek and A. M. Kashcheyev; Device for Determination of Passage of "Top Priority" Messages in Receiving Section of Telegraph Station Operating on Code Communtation

Class $21a^1$, 10_{01}. No 112484 -- B. P. Terent'yev and Yu. V. Bogoslovskiy; Automatized Telegram Reception Method

Class $21a^1$, 11_{05}. No 110118 -- A. G. Smiryagin, L. A. Korobkov, and S. F. Shavrin; Method of Storage and Reproduction of Telegraph-Signal Coded Combinations

Class $21a^1$, 32_{01}. No 111706 -- L. A. Korobkov, V. Ye. Belovitskiy, and A. B. Lobanov; Fast Operating Roll-Type Electronic Terminal Telegraph Apparatus

Class $21a^1$, 34_{04}. No 112389 -- N. A. Isayev; Method of Synchronization of Receiving and Transmitting Apparatus for the Purpose of Oscillographic Investigation of Frequency Response of Long-Distance Television Routes

Class $21a^1$, 34_{13}. No 112443 -- A. P. Nefed'yev and B. V. Krusser; Two-Sided Target of TV Transmitting Tube

Class $21a^1$, 36. No 110069 -- A. B. Zalkind, N. Ya. Matyukhin, and O. V. Rosnitskiy; Method of Commutating Current Square Pulses by Junction Transistors

Class $21a^1$, 70. No 111117 -- V. A. Godlevskiy and M. N. Stoyanov; Signal Transmitting Method for Automatic Telephone Station

Class $21a^2$, 12_{04}. No 111442 -- A. M. Pshenichnikov; Current Rectifier

Class $21a^2$, 14_{02}. No 112397 -- A. T. Prokhorov; Exponential Horn

Class $21a^2$, 36_{06}. No 109253 -- D. V. Kats; Method of Dividing Pulse Frequency

Class $21a^2$, 36_{06}. No 111235 -- S. I. Grusevich and M. M. Matveyev; Method of Generating Pulse Series for Automatic Telephone Stations With Pulse-Time Hunting Method

Class $21a^2$, 36_{22}. No 112254 -- A. A. Pirogov; Method of Controlling Synthesizing Quadripole in Message Receiver

Class $21a^3$, 37. No 111915 -- G. A. Novikov, V. A. Goryachev, S. B. Shapiro, and Ye. K. Opol'skaya; Device for Two-Sided Communication Between Substation and City Automatic Telephone Station

Class $21a^3$, 51_{10}. No 112352 -- D. I. Dudko, V. F. Marek, and Ya. E. Tatuyan; Blocking Oscillator for Telephones Lines

Class $21a^3$, 67_{30}. No 108430 -- B. N. Voznesenskiy, B. S. Livshits, and S. V. Levina; Method of Transmitting Inductive Signals on Telephone Lines and Device for Their Reception

Class $21a^4$, 6. No 111229 -- N. K. Svistov and V. S. Morozov; Noise Voltage Electric Generator

Class $21a^4$, 8_{01}. No 111264 -- Yu. B. Nesvizhskiy and A. Z. Levenberg; Self-Oscillator With Variometer

Class $21a^4$, 8_{01}. No 111716 -- F. I. Kozhin; Frequency -Modulated Self-Oscillator

Class $21a^4$, 8_{02}. No 112115 -- V. M. Ivanova, A. I. Belokonev, and A. B. Aronov; Quartz Heterodyne Circuit

Class $21a^4$, 8_{13}. No 112482 -- A. A. Shenogin; Noise Generator of Symmetrical Wave Range

40. East German Conference Accents Noise Problem

"Conference on 'Production of Noise by Components' in Gera" (unsigned article); Berlin, Radio und Fernsehen, No 20, Oct 58, pp 612-613

A 20-21 August 1958 conference on noise produced by components was sponsored jointly by the Committee for Components of Communications Engineering of the Chamber of Technology and the Union of Electrical Engineers of the Gera district. About 120 persons from East German industry and institutes took part. The papers read were as follows.

Dr-Engr Lunze, VEB WBN, Teltow, "Methods of Computation in the Case of the Noise Processes;" Dipl-Engr Drechsel, VEB WBN, Teltow, "Generation of Noise by Semiconductor Diodes;" Dipl-Engr Winkler, VEB WBN, Teltow, "The Noise Equivalent Circuit of the Transistor"; Dipl-Engr Guenther, VEB Carl Zeiss Jena, "An AF Amplifier Input Stage With Especially

Favorable Signal-to-Noise Ratio"; Dipl-Engr Paul, VEB WBN, Teltow, "Noise Generation of Transistor Circuits"; Dipl-Phys Mutschke, Erfurt, "The Flicker Effect of Tubes"; Dipl-Engr Lunze, VEB WBN, Teltow, "Noise Generation of Resistances"; and Dr-Engr Leberwurst, IPF, Dresden, "Noise Generation of Semiconductor Resistances."

The article gives brief summaries of each of these papers and gives the following summary of the concluding remarks of Professor Falter:

> "As can be seen from the reports, there are serious problems for both engineering and technology with respect to the limitation of the noise of components and semiconductors. This applies especially in the case of high frequencies. For this reason, the series of papers was scheduled in order to provide a clear presentation of the many-sided problem of noise.
>
> "Much work is still to be done toward increasing the quality of semiconductors, and the knowledge acquired here should help overcome many difficulties. At the next conference, scheduled for the spring of 1959, the frequency problems of components will be treated."

41. All-Union Conference on Refrigeration Scheduled for January-February 1959

"All-Union Intervuz Scientific and Technical Conference"; Moscow, Kholodil'naya Tekhnika, No 4, Jul/Aug 58, p 76

In January-February 1959 in Leningrad it is planned to hold an all-union invervuz scientific and technical conference on the achievements and tasks in the production and use of refrigeration in the national economy [a vuz is a higher education institution].

The following questions will be discussed: thermodynamics and heat transfer, refrigeration machine building and the production of cold, operation of refrigerating systems, construction of refrigerators and the selection of rational layouts, measurements and measuring instruments, automatics, heat insulation of refrigerating devices and structures separation of gas mixtures by the deep freezing method, air conditioning, technology of refrigeration of food products, refrigeration transport, production and use of water and dry ice, the use of cold in various branches of the economy, the economics of production and utilization of refrigeration, and training of cadres.

The organization committee of the conference requests organizations wishing to participate in the conference to report the titles of papers and name and address of authors of papers. Summaries of papers, 2 typewritten pages long, should be sent before 1 September 1958 to this address: Leningrad, tsentr, ulitsa Lomonosov, No 9, Leningrad Technological Institute of the Refrigeration Industry.

42. New Device for Detection of Insulation Deterioration

"Device for Automatic check of Insulation in Hydrogenerator Excitation circuits," by V. L. Svetlichnyy; Moscow, Elektricheskiye Stantsii, No 9, Sep 58, pp 49-50

"To detect deterioration of insulation below permissible values in the excitation circuits of hydrogenerators, at one hydroelectric station equipped with remote controls there was installed [provision for] automatic signaling check of insulation. The need for such a control has resulted from relatively frequent damages to such circuits. During a 3-year period, four cases of sudden deterioration of insulation and metallic short-circuiting to the ground (in three of these cases the damage was observed in the rotor winding proper) occurred in the excitation circuits of hydrogenerators."

The new system for insulation checking possesses a high degree of sensitivity; it operates when the insulation of the excitation circuit drops below 0.5 megohm, thus allowing for measures necessary to prevent the occurrence of a short circuit.

The principle of operation of the system is as follows: the negative pole of the exciter is connected to the ground through a resistor; the exciter voltage is distributed between the resistor and equivalent resistance of the insulation of the positive pole in direct proportion to the values of these resistances. When the insulation resistance is high, the voltage at the resistor is small; during a short-circuit it will increase to almost the full voltage of the exciter.

The circuit for automatic insulation check comprises the following components: 6N8S vacuum tube, type KDR-1 selective relay, power transformer, 0.5- and 10-microfarad smoothing capacitors, LN-1 and LN-2 signal neon bulbs, VS-0.5 carbon resistors, indicating relay, pole switch, MKU-48 blocking relay, EP-101A output relay, and EV-134 time relay.

43. Approximation of Differentiable Functions on a Finite Segment of the Real Axis by Algebraic Polynomials

"Concerning the Best Approximations on a Finite Segment of the Real Axis of Differentiable Functions by Algebraic Polynomials," by A. F. Timan; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, Vol 22, No 3, May/Jun 58, pp 354-361

A strengthening is derived for the known limiting theorem of S. N. Bernshteyn for the best approximations of differentiable functions by algebraic polynomials on a finite segment of the real axis.

44. Canonical Form of All Petrovskiy Operators Given

"Note on the Petrovskiy Criterion for the Uniform Correctness of the Cauchy Problem for Partial Differential Equations," by Academician S. L. Sobolev; Moscow, Doklady Akademii Nauk SSSR, Vol 121, No 4, 1 Aug 58, pp 598-601

The Petrovskiy condition for the uniform correctness of the Cauchy problem for equations with two independent variables and constant coefficients and of the form

$$Lu \equiv \partial^n u / \partial t^n + \sum_{k<n} A_{k,l} \partial^{k+l} u / \partial t^k \partial x^l = F$$

concerns the form of the operator L.

In order that this equation admit, in an infinite region, a solution which satisfies the conditions

$$u|_{t=0} = \partial u / \partial t|_{t=0} = \ldots = \partial^{n-1} u / \partial t^{n-1}|_{t=0} = 0$$

and which is a continuous function of the coefficients $A_{k,l}$ and the right side F, it is necessary and sufficient that all roots of the equation

$$\Delta(\lambda, \alpha) \equiv \lambda^n + \sum_{k<n} A_{kl} \lambda^k \alpha^l = 0,$$

for purely imaginary values of α, lie to the left of a certain straight line

$$\sigma > \sigma_0, \quad \text{where } \lambda = \sigma + it.$$

Equations which satisfy the Petrovskiy condition are called Petrovskiy equations and the operators of the left side of such equations, Petrovskiy operators (I. G. Petrovskiy, Byull MGU [Bulletin of Moscow State University], No 7, 23, 1938).

It is shown that all Petrovskiy operators can be represented in the canonical form

$$Lu = \prod_{s=1}^{n} \left(\frac{\partial}{\partial t} - A_s \frac{\partial^{m_s}}{\partial x^{m_s}}\right)u + L_2 u,$$

where L_2u represents the set of all terms of lower order and all $\frac{\partial}{\partial t} - A_s \frac{\partial^{m_s}}{\partial x^{m_s}}$ are elementary Petrovskiy operators.

45. Statistical Method for Computing Integrals Discussed

"A Reinforced Law of Large Numbers for Selection From a Uniformly Distributed Random Quantity," by A. G. Postnikov; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, Vol 22, No 3, May/Jun 58, pp 433-438

The paper discusses the foundation of a statistical method for computing integrals of arbitrary multiplicity. A theorem is introduced which is an expansion of a result obtained by Glivenko concerning empirical distribution functions.

46. Theory of Functions

"Several Questions Concerning the Continuity and Differentiability of Measurable Functions," by G. Kh. Sindalovskiy; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, Vol 22, No 3, May/Jun 58, pp 395-432

The concepts of φ-continuity and φ-differentiability are introduced for a measurable function and their connections with ordinary continuity and differentiability on sets of positive measure are studied.

Aviation Medicine

47. Origin and Prevention of Illusions in Flight

"Illusions During Flight," by Lt Col Med Serv M. Yemel'yanov, Candidate of Medical Sciences; Moscow, Sovetskaya Aviatsiya, No 195 (3059), 20 Aug 58 p 2,

"False sensation of position or motion of an airplane (illusions) can be experienced by any pilot and can occur under any flight conditions. Flase sensations contribute substantially to many fatal accidents. Illusions are more frequent and cause spatial disorientation more often, however, under conditions of reduced visibility, such as heavy clouds or night flying even during instrument flight.

"Causes of Illusions"

"Activity of the brain determines spatial orientation in humans. The brain receives signals from various organs that are acted on by external irritations, causing body movements or changes in body position. The organs from which the brain receives signals are the eyes, vestibular apparatus, and nerve formations in the muscles and skin.

"I. M. Sechenov said that if the brain did not make any adjustments in such organs as the eyes, everything we see would seem distorted. We always experience illusions when inaccurate visual sensations are not supplemented by signals from other nerve formations. For example, a false sensation of movements of things takes place when one looks out of the window of a moving train.

"Misinterpretation of degrees of bank during flights above clouds occurs when the edge of the clouds is not situated horizontally. False impressions of immobility, 'hanging,' also arise at altitudes above clouds. Flights at night over smooth surface of water creates a situation where the conception of the distance to the water becomes lost and a whole series of other illusions may emerge.

"When the vestibular apparatus is greatly irritated during flight, misinterpretation of degrees of bank or false sensations of tilting may result when in a skid or slip. These symptoms can be observed during a long period of skidding leading the airplane into sharp curvilinear turns; they also can be observed when an airplane is recovering from these turns in a manner which is identical to that of great acceleration on a runway or to sharp braking action.

"False sensations often appear when changing from flight with the horizon visible to instrument flight.

"People are predisposed to illusions who have not developed good habits in instrument reference, who have had an interrupted flying career, who have been transferring from one type of technical assignment to another, whose nervous systems have been affected as a result of some disease (particularly influenza), use of alcoholic beverages, etc. Illusions may also be caused by lack of oxygen, fatigue, or lack of confidence in the instruments.

"Preventive Measures"

"Illusions, in the majority of cases, are physiological phenomena which arise under certain specific conditions in perfectly healthy persons. Per se, they do not have to be the reason for removal of personnel from flying assignments. It must be borne in mind, however, that illusions, may reflect a morbid condition and the appearance of illusions may be associated with increased sensitivity of vestibular apparatus or illness.

"If the same illusion is repeated often, it may turn into a conditioned reflex. Elimination of such illusions requires special training under qualified instructors.

"Illusions of bank, glide, and skid appear more often than other illusions. They consist of sensations of ascent when turning or descent when coming out of a turn and a false sensation of reverse rotation [Protivovrashcheniye; false impression of turning in the opposite direction] after exit from a bank. Visual illusions can also produce a sensation of inverted flight.

"Results of experiments show that regular physical reactions underlie misinterpretation of degree of bank. They clearly show that the visual organ inhibits the activity of the vestibular apparatus. The vestibular apparatus is capable of storing weak irritations. Sensitivity of the vestibular apparatus, however, increases considerably in the dark, when illumination is poor, or when equilibrium is not stable. If inhibition, caused by the visual organ, becomes momentarily weak for some reason, then even those irritations of vestibular apparatus that are insignificant may cause false sensations in a pilot.

"Knowledge of how to distribute and shift attention properly and the ability to orient oneself rapidly to the airplane's position are very important.

"A flyer must be physically strong and possess great endurance. Strong muscle tonus inhibits vestibular illusions (of reverse rotation). Physical exercises which tend to strengthen the vestibular apparatus, such as balancing, are very useful. Along with physical training, it is necessary to observe a proper regimen of work and rest. Consumption of alcohol is harmful.

"The best preventive measure is confidence in the readings of instruments and the ability to critically evaluate sensations which may arise. Nervousness and distraction from the instruments may hinder the elimination of illusions. Results of investigations have demonstrated that fixing attention on one of the instruments can check manifestation of any illusion of bank. If false sensations are apt to occur in a flyer, when he is flying through clouds, it is necessary for him to begin instruments flying as soon as possible and avoid diverting his attention from the instruments even if there are gaps in the clouds.

"When illusions do appear, their inhibition can be achieved by excerting a force on various groups of muscles. This can be done by energetically pressing the steering handles, or inclining the head and exerting a force on the abdominal muscles and the muscles of thigh. Squinting the eyes and subsequently concentrating on the instruments and carrying on verbal communication with those directing flight operations are helpful.

"It is the job of medical units to acquaint flyers with the characteristics of illusions in flight, their causes, and methods of preventing them."

48. Chamber for Work With Bacterial and Viral Aerosols

"Construction of a Chamber for Work With Viral and Bacterial Aerosols," by I. I. Terskikh, V. I. Chervonskiy, and V. M. Bolotovskiy, Institute of Virology imeni Ivanovskiy; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 9, Sep 58, pp 130-133

"The experimental study of aerosol infection in animals is of great scientific and practical interest. The study of aerosol infection with pneumotropic pathogens, particularly the ornithosispsittacosis virus, is especially important.

"By dosing with a quantity of dispersed virus-containing material at a known rate of air current, temperature, and humidity, it is possible to conduct a study of those conditions on which more active infection of an animal depends. An explanation of what substances are capable of adsorbing virus particles and protecting an animal from infection is also of interest. Those problems enumerated and a number of others, including the pathogenesis of aerosol infections, can be resolved only with an appropriate, completely hermetic chamber with a system which disinfects the air processed and protects the workers.

"Setting about to resolve the above-mentioned problems, we studied the existing literature concerning various designs for aerosol chambers and arrived at the conclusion that some of them are not safe to operate (Robertson, Puck and Robertson, Gloyer, Loosli, Smorodintsev, Rechmenskiy), and others (Rosebury, Leif, Krueger) are complex and cumbersome. Therefore, in 1954 we proceeded to develop a chamber which would permit us to perform a number of experiments with virus aerosols.

"As a result of work done in 1955, we prepared a chamber which, because of its size, can be used in the laboratory for performing different experiments and which prevents dispersal of infection into the surrounding atmosphere. We present below a detailed account of the principle of action and a diagram of the design according to which the 'Tekhnolog' factory built the IVK_1, chamber in 1956.

"It should be mentioned that the part of the chamber responsible for creating an aerosol is a sprayer (inhalator), the design of which can be very diverse and which can be changed, since it is detachable. The chamber described can be used for work with various aerosols -- virus, bacteria, antibiotics, etc.

"The principle of action of the experimental apparatus is as follows: the aerosol, created in the spray compartment of the working chamber, is pumped through filters or through an inlet opening into two hermetic compartments in which the experimental animals are placed. The air drawn out of the chamber is disinfected.

"The apparatus (Figure 1) is arranged in a housing enclosed on all sides. The frame of the housing is welded carbon steel. The top and sides are enclosed by louvered panels. The bottom is detachable.

"The chamber is mounted in the upper part of the housing, and the vacuum pump, electric and liquid sterilizers, and other equipment, in the lower. Two glass peepholes are located in the panels of the front wall of the housing and are used for observing the readings of the water meter on the liquid sterilizer and of the water tank of the vacuum pump.

"Intake and outlet air stopcocks are located on the top of the housing. On the left, in a recess, there is a stopcock for the intake of air into the working chamber and there are two stopcocks for the transmission of compressed air to the sprayers; a stopcock for exhausting the protective chamber is located near them. At the right, in a recess, there are two stopcocks for exhausting air from the animal compartments, a stopcock for exhausting air from the protective chamber, and two small stopcocks which connect the animal compartments with a differential vacuum meter.

"A shield with differential and spring vacuum meters is attached behind the housing at the right, and a gas meter for air pumped out of the chamber through the electric disinfector is placed on an adjustable-height stand.

"A panel for the electric equipment is mounted on the rear wall of the room to the right of the apparatus.

"The apparatus consists of the following basic parts: (Figure 2): a housing (not shown on the diagram), a protective exterior chamber, (9); an interior working chamber (10, 22); a compressor (2) with an electric motor (1); an electric disinfector (30, 31, 32); a liquid disinfector (35); a vacuum pump (37) with a water tank (40) and an electric motor (39); two BUV bactericidal lamps (15); the electric panel of the apparatus (42); a panel with vacuum meters (25, 26); and a gas meter (33).

"The working chamber, located inside the protective housing (9), is divided into three hermetic compartments -- a spray compartment (10), in which the material being studied is dispersed, and two compartments with identical dimensions for the animals (22). The area of the spray compartment is equal to the sum of the area of the two animal compartments.

"There are two glass-covered loading-observation ports in the lid of the chamber (one of them serves both animal compartments). The lids of the ports are kept in place with special wing-nuts. After unscrewing the nuts and opening the hinge bolts, the lids of the ports, open to the side for loading or unloading the chambers and rest on special lugs. In the wall of the working chamber, there are similar observation-loading ports in each animal compartment; the lid of the port in the spray compartment is detachable, having a central screw bolt.

"There are two round windows with flanges in the partition which separates the spray chamber and the animal chambers; the cartridges with the filter material to be tested are inserted through these windows. The cartridge is secured with special screws by means of a socket wrench.

"Windows are located in the side walls of each of the three compartments in the working chamber; electric lamps can be placed on the external side of these windows as a source of light.

"Two BUV (15) bactericidal lamps for ultraviolet irradiation are placed on the ports of the working chamber.

"Two sprayers are located in the spray compartment -- one (5) for the material to be studied and the other (3) for the disinfecting fluid.

"Compressed air for the sprayer is supplied by a compressor (2); the air which is pumped in first passes through a filter (8).

"Cartridges (19) with the experimental animals are placed on supports (18) in the animal compartments. Fittings accommodate two sizes of cartridges, large and small. The cartridges are detachable and adjustable in length. There is a respiratory aperture in the front part of the cartridge (against the nose of the animal).

"A spray tube (20) for spraying the disinfecting fluid and for taking aerosol samples is placed in the upper part of each animal compartment.

"Air is pumped out of these compartments, and also out of the protective chamber through stopcocks (27, 28, 29) with a vacuum pump (37), after which it passes through an electric furnace (32), a cooling coil (31), a gas meter (33), and a liquid disinfector (35).

"The vacuum pump is equipped with a 5% lysol trap. The disinfected air pumped out of the system, together with the drops of lysol absorbed, enters a bath (40), where the lysol settles. The level of lysol in this bath, indicated by a water gauge (41), is kept constant by appropriate regulation of the overflow stopcock, (38) and by periodic addition of lysol.

"The electric disinfector consists of an electric furnace (32) and a cooling coil (31) in a water tank.

"The electric motor of the furnace is a nichrome spiral coiled on a fire-clay ceramic. The space between the furnace and its outer covering is filled with crumbled asbestos. Air passing through the electric furnace, heated to a temperature of around 170°, enters the cooling coil, leaves it at a temperature of around 40°, and passes through the gas meter (33) into the liquid disinfector (35). The temperature of the air leaving the electric furnace is determined by means of a temperature relay (51), and is measured by a thermocouple (52). The electric furnace is interlinked with the vacuum pump and is turned on with an ordinary switch.

"The liquid disinfector is a vertical cylindrical reservoir filled with disinfecting solution; a number of convex disks are placed at the top of the reservoir. The disks have perforations on the edges, and in the center. Because of this, air in the lower part of the reservoir, rising, achieves a zig-zag path in the disinfecting solution and is disinfected in this manner.

"The electric control panel is mounted in a separate metal housing. Located on the panel are a millivoltmeter, two signal lights, and five switches. A cable runs to the panel from the apparatus, and a lead runs from the thermocouple located at the end of the electric furnace.

"The millivoltmeter indicates the temperature of the air coming out of the furnace. One of the signal lights indicates when the electric motor of the compressor is truned on, and the second when the electric motor of the vacuum pump and the furnace interlinked with it are turned on.

"The housing of the vacuum meter is an ordinary panel on which a differential liquid manometer with a V-shape tube, and a spring manometer are mounted. The differential manometer shows the difference in the degree of rarefication between both animal chambers, and the spring manometer, the degree of rarefication in the suction nozzle of the vacuum pump. In addition, the temperature, relative humidity, and the rate of movement of the air in the chamber are determined.

"Experimental study of aerosol infection in animals by the use of the chamber described above will be presented in a subsequent report. It should be mentioned that automatic loading of animals through an air lock has been added to the design described above. Thus, the new model of the IVK_1 will be improved."

The following bibliography was appended to the article:

Rechmenskiy, S. S., The Problem of Air-Borne Infection. M., 1951

Smorodintsev, A. A., Gulamov, A. G., Chalkina, O. M. Sov. Vrach. Zhurn., 1940, No 4, pp 255-264

Glover, R. E., Brit. J. Exper. Path., 1944, V 25, p 141

Leif, W. R., Krueger, A. P. J. Infect. Dis., 1950, v 87, p 103-116

Loosli, C. G. Robertson, O. H., Puck, T. T. J. Infect. Dis., 1943, v 72, pp 142-152

Puck, T. T., Robertson, O. H., Lemon, H. M., J. Exper. Med. 1943, v 78, pp 387-406

Robertson, O. H., Bigg. E. a. oth. Science, 1941, v 93, pp 213-214

Robertson, O. H., Science, 1943, v 97, p 495

Rosebury, T. a. oth. Experimental Air-Borne Infection. Baltimore, 1947.

49. Combined Vaccination Against Plague and Tularemia

"Experimental Study of Combined Vaccination Against Plague and Tularemia," by N. F. Kalacheva, Tularemia Division, Saratov Scientific Research Institute of Microbiology and Epidemiology of the Southeastern USSR; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 9, Sep 58, pp 78-83

This article concerns research on the use of associated live vaccines and live vaccines combined with killed vaccines. The author refers to the first combined vaccine -- live plague vaccine with killed trivaccine or NIISI vaccine, studied by Korobkova in 1950-1951 and the work of Akimenko on live tularemia vaccine associated with smallpox and NIISI polyvaccine, and also with tetanus anatoxin. The author's research was undertaken to explore the possibilities of immunizing with two live antigens, plague and tularemia.

A combined vaccine consisting of dry plague vaccine strain EV and dry tularemia vaccine was administered to guinea pigs cutaneously and subcutaneously. Results of all experiments are discussed in the text and presented in tabular form. Conclusions presented on the basis of these results are as follows:

"1. It was established in experiments on guinea pigs that vaccination with a mixture of plague and tularemia vaccines guaranteed immunity to 100 Dcl of a virulent culture of B. pestis in 90-100% of the animals; the same results were obtained upon introduction of the corresponding monovaccines.

"2. The most favorable immunizing dose for the plague component in the combined vaccine is a dose of one billion microbial cells; for tularemia, 10,000-100,000 microorganisms.

"3. It was established that immunity to plague infection is maintained up to 6 months in 50% of the animals (the time of observation) when the subcutaneous method of vaccination is used, and in 100% of the animals for the same period of time when the cutaneous method of applying the vaccine is employed."

5C. Trivalent Vaccine for Plague, Tularemia, and Brucellosis

"The Problem of Combined Immunization With Live Vaccines," by E. I. Klets, R. S. Kolechik, Ye. P. Potapova, G. P. Vyborov, and K. I. Shvets, Irkutsk Scientific Research Institute [Irkutsk Scientific Research Antiplague Institute]; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 10, Nov 58, p 122

"An experimental examination of the possibility of producing immunity in laboratory animals to three infections at a time -- plague, tularemia, and brucellosis -- by means of a single immunization with the corresponding vaccines was an objective of this research. For this purpose, we performed experiments on several groups of guinea pigs: 15 pigs from the first group were immunized with live tularemia vaccine and were then infected with a tularemia culture (1,000 MLD); 15 pigs of the second group were immunized with live brucellosis vaccine and were infected with a Br. ovis culture (two minimum infecting doses); 17 pigs from the third group were immunized with live plague bivaccine and were infected with a plague culture (1,000 Dcl); animals of the fourth, fifth, and sixth groups (16 in each group) were immunized with the live combined vaccine and were infected with one of the cultures -- tularemia, brucellosis, or plague; finally, 28 pigs of a control group (nonimmunized) were divided into three subgroups and were infected, simultaneously with the experimental animals, with one of the test cultures (nine pigs, with tularemia and brucellosis; ten pigs, with plague).

"Immunization and infection were performed subcutaneously in all groups. A suspension (prepared ex tempore in physiological solution) of 2-day agar cultures of corresponding vaccine strains, calculated as follows for a single dose, was selected as a complex vaccine: 250 million microorganisms of Brucella strain BA, 25 million microorganisms of a tularemia vaccine strain, and 1.5 billion plague microorganisms, strains No 1 and 17 (bivalent plague vaccine).

"The results of the experiment showed that 11 out of 14 guinea pigs infected with brucellosis were found to be immune after immunization with the complex vaccine, and that 13 out of 15 animals infected with brucellosis were resistant after vaccination with brucellosis monovaccine. Upon pathomorphological investigation of material from all of these animals, benign changes which had taken place in their organs were detected. Out of 14 pigs infected with tularemia following immunization with the combined vaccine, all survived, as did 15 animals infected after immunization with tularemia monovaccine. Two out of 14 pigs infected with plague after immunization with combined vaccine died, and one out of 11 pigs immunized with plague bivaccine before infection died.

"The pigs withstood the subcutaneous introduction of live combined vaccine comparatively well, with local reaction of a moderate nature, which did not differ from the reaction in animals inoculated with the monovaccine; there were no perceptible changes in temperature and weight. The invasion capacity of the strains which comprised the combined vaccine remained the same as they were when administered separately. Immunological indexes of reactivity of the guniea pigs to the introduction of combined vaccine (agglutination reaction and allergic skin test) demonstrated the simultaneous elaboration of immune bodies with respect to all antigens included in the combined vaccine, tularemia and brucellosis in particular.

"The data obtained show that the antigens introduced in the combined vaccine are completely compatible and that the vaccine prepared from them can probably be employed for simultaneous immunization against plague, tularemia, and brucellosis."

Pharmacology and Toxicology

51. Synthesis of an Isomer of Sarcomycin With Antitumor Action

"Investigations of Sarcomycin and Its Analogs; II. The Synthesis of an Isomer of Sarcomycin," by M. M. Shemyakin, M. N. Kolosov, M. G. Karapetyan and V. Ya. Rodiyonov, Institute of Biological and Medical Chemistry, Academy of Medical Sciences USSR; Moscow, Zhurnal Onshchey Khimii, No 8, Aug 58, pp 2068-2074

The synthesis of an isomer of sarcomycin, an antitumor antibiotic, was accomplished. This isomer, isosarcomycin, differs from the antibiotic with respect to the position of the methylene group on the ring. Isosarcomycin was obtained in the form of an ethyl ester derived from cyclopentanone-3-carboxylic acid; the condensation of the latter with formaldehyde and piperidine, followed by the esterification and iodomethylation of the compound obtained, produced the corresponding quaternary ammonium salt, the separation of which resulted in the synthesis of the ester of isosarcomycin.

52. Sarcolysin Effective Against Bone Tumors

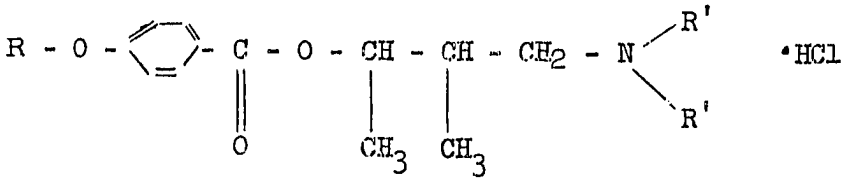
"Here is the News" (unsigned article); Marseille, La Marseillaise, 31 Oct 58, p 8

In a lecture given in Vienna, Prof Nikolay Blokhin of the Moscow Cancer Institute announced that a new Soviet medicine, Sarcolysin, was effective in the treatment of certain cases of bone tumors.

53. Effect of Benzoic Acid Esters

"The Relationship Between the Local Anesthetic, Cholinolytic and Anticholinesterase Action of Benzoic Acid Esters," by N. Ye. Akopyan and V. M. Sambelyan, Pharmacology Section, Institute of Organic Chemistry, Academy of Sciences Armenian SSR (director, Armenian SSR Academician A. L. Midzhoyan); Moscow, Farmakologiya i Toksikologiya, No 5, Sep/Oct 58, pp 38-43

A study of the relationship between the local anesthetic, cholinolytic, and anticholinesterase action of a homologous series of 28 compounds represented by the following common formula was conducted:



where R = aliphatic and aromatic radicals, and R' = methyl or ethyl radicals.

The local anesthetic properties of the compounds were investigated by the Ren'ye method. The peripheral n-cholinolytic action was determined on the frog's rectus abdominis muscle, while the anticholinesterasic activity was determined by the Borisov-Rozengardt method.

As a result of the investigation, the following conclusions were derived:

1. All 28 compounds of the homologous series possess pronounced local anesthetic and cholinolytic action.

2. A close parallelism between the local anesthetic and cholinolytic (nicotinolytic) action was observed.

3. Among the diethylamino alcohol compounds having normal hydrocarbon chain configuration, maximum local anesthetic and peripheral n-cholinolytic activity was observed in compounds having the propyl radical.

4. In the series of dimethylamine derivatives, the maximum in both types of activity was observed when the butyl radical was present.

5. Among the isomers of diethylamino alcohol derivatives, the greatest activity was observed with compounds having the isobutyl radical.

6. Compounds of this homologous series possess weak anticholinesterase activity.

7. No parallelism between the local anesthetic and the anticholinesterase activity was observed.

8. It is possible that the n-cholinolytic action plays a determining role in the mechanism of the local anesthetic action.

54. Effect of Aminasine on Cardiac Glycosides

"The Effect of Aminasine on Changes of Sensitivity to Cardiac Glycosides," by V. A. Pokrovskaya, Analytical Control Laboratory of Fourth Main Administration of Ministry of Health USSR (scientific director, Prof G. N. Pershin); Moscow, Farmakologiya i Toksikologiya, No 5, Sep/Oct 58, pp 43-46

The purpose of this work was to study the effect of aminasine on the sensitivity of the heart to cardiac glycosides. The experiments were conducted on live frogs and on isolated frogs' hearts using the Straub method. As a result of the experiments, it was determined that aminasine lowers the sensitivity of the frog heart to various cardiac glycosides. This effect was observed both in live animals and in isolated hearts. Aminasine is sometimes used in combination with other drugs -- hypnotics, spasmolytics, ganglio-blockers, etc.

Public Health, Hygiene and Sanitation

55. Public Health Service in Azerbaydzhan

"Forty Years of the Soviet Health Service," by B. Agayev, Minister of Health Azerbaydzhan SSR; Baku, Azerbaydzhanskiy Meditsinskiy Zhurnal, No 7, Jul 58, pp 69-71

"The head of the Communist Party and founder of the Soviet State, Vladimir Il'ich Lenin, recognized that the problem of health protection is primarily a social problem, a problem of significance as far as the welfare of the working class is concerned. On 11 July 1918 he therefore signed the decree of the Council of People's Commissars creating the People's Commissariat of Health RSFSR. This commissariat was to serve as the center of medical and sanitary service to the population.

"Lenin's decree identified the main forms of the Soviet health service. These forms are to be national in character and preventive in nature as well as free of charge.

"N. A. Semashko became the first Commissar of Health of the RSFSR. The newly organized Commissariat of Health RSFSR inherited a situation fought with difficulties which were caused by imperialist intervention, civil war, hunger, ruin, and prevalence of epidemics of various kinds. The Communist Party turned the task of ending these epidemics over to the Commissariat of Health RSFSR. The Commissariat of Health RSFSR was also commissioned to endeavor to put an end to social diseases like tuberculosis, syphilis, and alcoholism and to offer special health protection to mothers and children. Sanitation service and working conditions of workers and peasants were to be improved.

"Health service in tsarist Russia was very poor. Health service in the peripheral areas was even worse. Since little effort was made to protect the population from disease, outbreaks of typhus, typhoid fever, dysentery, and other communicable diseases were frequent. Malaria was the scourge of the population of Azerbaydzhan.

"In 1913 there were 290 physicians and 43 therapeutic establishments in Azerbaydzhan.

"The first Commissar of Health of Soviet Azerbaydzhan, Movsum Kadyrli, was appointed by the republic Communist Party soon after the revolution. With the aid of the People's Commissariat of Health RSFSR, Kadyrli began to expand the therapeutic establishments in the republic and to organize a network of medical schools.

"Sanitary-epidemic control work began to function for the first time in Azerbaydzhan. A special committee was appointed to fight malaria. The fight against trachoma, dysentery, and other communicable diseases continued unabated. The medical faculty of the Azerbaydzhan State University inaugurated a program of training medical cadres. This was done with the aid of Russian scientists. A number of medical technical schools were also established. A nursery was established in Azerbaydzhan in 1921.

"Forty years have passed since the Bolsheviks gained control of the government. The health service of Azerbaydzhan now consists of 500 hospitals, 569 outpatient clinics and dispensaries, 1,199 professional medical and feldsher (and feldsher-midwife) posts, 87 sanitary-epidemiological establishments, 14 medicosanitary units, 22 hospitals for children, 333 nurseries, and 71 sanatoriums and rest homes (52 of which are for children).

"Health service in Azerbaydzhan is rendered by 6,824 physicians and 20,643 people of subprofessional level. There are 1,126 pharmacists in the republic now.

"There are two medical universities and nine scientific research institutes. The personnel in these universities and institutes number 746 scientific workers. This figure includes 54 doctors of sciences, 52 professors, and 241 candidates of medical sciences.

"Allocation of funds for health service has been increasing each year: in 1958 it amounted to 636.5 million rubles.

"Improvement in living standards of workers and better medical and sanitary service to the population has resulted in putting an end to mass incidence of communicable diseases and to almost complete eradication of malaria in the republic. Azerbaydzhan can now boast of a high birth rate and a low mortality rate.

"The sanitary profile of cities and villages of the republic has been changing every year. Preventive medical work is being conducted on a large scale. The Ministry of Petroleum Industry Azerbaydzhan SSR alone spends up to 10 million rubles on maintenance of industrial hygiene and the protection of workers' health.

"Further improvements must be made in the system of organization of health service and in the cultural level of medical service. This is in line with the historical decision of the 20th Congress of the Communist Party of the Soviet Union.

"The 22d Congress of the Communist Party of Azerbaydzhan and the recent session of the republic Supreme Soviet urged the health agencies to make greater efforts to correct defects in medical service and to formulate plans for the improvement and expansion of therapeutic and preventive establishments."

Physiology

56. Biological Effects of Noise

"Investigation of the Effect of Noise on Some Functions of an Organism," by N. K. Krylova Informatsionnyy Byulleten' In-ta imeni Erismana (Information Bulletin of the Institute imeni Erisman), 1957, 6-7, 50-51 (from Meditsinskiy Referativnyy Zhurnal, No 8, Aug 58, p 26)

"Research was conducted both in industrial establishments and under laboratory conditions. In one of the industrial establishments the frequency of noise was high, 3,200-4,800 cycles/second; noise in another

industrial establishment was of low frequency, between 100 and 150 cycles/second. Loudness of noise in both cases was 80 decibels. The noise in the laboratory was between 1,600 and 2,400 cycles/second and its loudness was between 50 and 115 decibels. The hearing and blood pressure of 192 women were examined before they went to work, at various times during working hours, and at the end of a day's work. Results of this investigation showed that a noise of 80 debicels' intensity does not produce any pronounced effect on hearing ability of women workers. When the level of noise is above 80 decibels, high frequency noise affects the cardiovascular system to a greater extent than noise of low frequency. The author thinks that the limit of harmful effect of noise on the cardiovascular system is within the 80-decibel zone or somewhat higher."

57. Symptoms of Vibration Sickness Described

"Clinical Course of Vibration Sickness," by A. S. Mel'kumova, G. V. Mkhitarov, and V. S. Luk'yanov, Informatsionnyy Byulleten In-ta imeni Erismana (Information Bulletin of the Institute imeni Erisman), 1957, 6-7, 45-49, (from Meditsinskiy Referativnyy Zhurnal, No 8, Aug 58, p 28)

"Of the 60 people examined (42 women and 18 men) who had been working for a period of 2-3 years, 50 people suffered from localized headaches which intensified during vibration. The people who had headaches complained of noise in the head and blurred vision to the point of fainting; they also had a feeling of irritability and aggressiveness. Comparison of electroencephalographic data with the clinical symptoms revealed existence of substantial shifts in cortical neurodynamics, such as abnormal cortical activity and the presence of foci of dominant excitation in the temporal portions of the cortex. Changes in cerebral and cardiac reflexes and persistent arterial hypotonia were also observed in some cases. A vasovegetative dystonia was manifest in 42 cases and assumed a diffused character. Intensity of all pathological symptoms increased as the length of employment increased. Symptoms of organic disorders of the peripheral nervous system were observed in 17 people. This disorder consisted of decreased cutaneous sensitivity of a distal type and a decrease of absence of tendon reflexes. A change-over in ovario-menstrual cycle was noted in 31 of 40 women examined; many women workers had hyperthyreosis."

58. Biological Effects of Ionized Air

"On the Question of Hygienic Significance of the Ionization of Air in Industrial Establishments," by D. I. Kagan and V. N. Kovalenko, Informatsionnyy Byulleten' In-ta imeni Erismana (Information Bulletin of the Institute imeni Erisman), 1957, 6-7, 57-62 (from Meditsinskiy Referativnyy Zhurnal, No 8, Aug 58, p 30)

"Prolonged action of highly ionized air on rabbits, even though negative aero-ions in it predominate, causes a depression in hemopoiesis in animals, particularly as far as the red blood is concerned. This also causes a disruption in protein metabolism as well as a lag in the general development of animals. The authors think that the biological action of aero-ions depends on the degree of intensity of absorption of aero-ions by the organism per unit of time. To take this factor into consideration, it was suggested that use be made of the 'coefficient of intensity of aero-ion absorption' which determines by how much the intensity of ion absorption per unit of time, during man's inhalation of highly ionized air, exceeds the intensity of absorption of aero-ions by the organism of man under ordinary conditions of natural ionization of atmospheric air. The maximum figure that this coefficient reaches in industrial establishments is between 1,000 and 1,200; when used therapeutically, it reaches 2,000."

59. Increased Emphasis on Electrophysiology

"Soviet Electrophysiology Must Be Developed," by Candidate of Biological Sciences Yu. Kratin (Leningrad); Moscow, Meditsinskiy Rabotnik, 26 Sep 58, p 2

"Soviet electrophysiology has an advantage over that found abroad in that it stands on a sound theoretical foundation. There are many excellent works in countries outside the Soviet Union; many of these works have been based on a highly technical foundation. But rarely can there be found a well-based connection between these works and general theoretical applicability.

"Physiology must now become an exact science. Its method must consist of an exact physicochemical analysis the main condition of which is concurrence, at the right time, with concurrent physiological processes. Any method that does not provide simultaneous recording and analysis of processes in the nervous system loses its significance, particularly in neurophysiology. A similar situation exists in biochemistry. Making a record of electric changes that take place is a relatively well developed method. By permitting the registering of the processes that take place in an organism at the same time recording takes place, electrography makes it possible to exert an effect on them and to make quite accurate observations of any changes produced. Electrophysiology created a need for

improving both the technique of irritation and the technique of recording reactions caused by various effects. This is why sound generators, photophone stimulators, and automatic panels which control the delivery of irritants have replaced the bell, bulb, etc. The kymograph gave way to the oscillograph, permitting simultaneous recording of a multitude of very rapid as well as slow processes.

"After the Eighth Congress of Physiologists of the USSR and the International Congress of Physiologists was held, the importance of electrophysiology began to increase. There is a decreasing number of physiological laboratories where some kind of electrophysiological method is not used. With the aid of electrophysiology, particularly that of electroencephalography, the circle of problems under investigation had been expanded. These problems deal primarily with the higher nervous activity, the electrophysiological solution of which is carried on extensively only in the USSR. For example, the collective of electrophysiologists in Tbilisi, headed by Academician I. S. Beritashvili, is studying one of the most important problems of the higher nervous activity: the role of reticular formation of the brain stem and its interrelation with the higher branches of the brain. Microelectrodes have been used in the past few years in Kiev, Tbilisi, and Moscow. Similar work has also been begun in Leningrad. In Rostov-na-Donu, A. B. Kagan suggested a method for implanting microelectrodes for picking up potentials of the brain.

"Electrophysological investigation of the problems of higher nervous activity is performed both by utilizing irritants from the external environment and by experimental action on the receptor fields and nerve conductors of the internal organs. Work like this has been under way for many years at the Institute of Physiology imeni Pavlov in Leningrad and at the Moscow Institute of Normal and Pathological Physiology of the Academy of Medical Sciences USSR. Many physiologists are conducting research in Leningrad and Moscow which deals with the electric activity of receptors.

"The aim of all these investigations is to discover the peculiarity of electric activity in connection with the morphological structure of the nerve tissue. This problem has been studied in much greater detail at the Brain Institute; an interesting new method of research using the encephaloscope was introduced by M. N. Livanov in cooperation with V. M. Anan'yev.

"The electrophysiological method is being introduced more and more extensively in comparative physiology. Such work is being successfully conducted at the Leningrad Institute of Experimental Medicine and at the Moscow University.

"The electrophysiological methods, particularly electroencephalography, are being utilized in the many and varied branches of medicine. Well-equipped electrophysiological laboratories can be found in the Institute of Neurosurgery imeni N. N. Burdenko (Moscow), Institute of Neurosurgery imeni A. L. Polenov, Military Medical Academy imeni S. M. Kirov, Psychoneurological Institute imeni V. M. Bakhterev (Leningrad), and some others. Systematic examination of patients and extensive theoretical work has been carried on at these institutes. Electroencephalography is beginning to be used more and more often in examining and diagnosing many and varied types of diseases encountered in therapeutic and psychiatric clinics, and in clinics for diseases of the nerves. However, its practical utilization has been hindered by the insufficient progress made in solving some difficult questions of electrophysiology and electroencephalography. This work can be carried on by combined efforts of physiologists and clinicists.

"A permanent organization bureau, headed by Prof V. S. Rusinov, was created at the first conference on electrophysiology of the central nervous system. Prof V. S. Rusinov was commissioned to see that a number of measures are taken to develop electrophysiology. A decision was made to establish the exchange of experience by means of periodic conferences. At present, consideration is being given to the creation of special sections on electrophysiology and electroencephalography within the framework of the All-Union Society of Physiologists. It will be necessary to publish a special collection of material covering electrophysiological research; appropriate magazine must also be published.

"A symposium on electroencephalography will be held this fall in Moscow. This will be the first such gathering held in the USSR. Scientists from France, England, Czechoslovakia, and a few other countries have been invited. Only a few Soviet electrophysiologists are acquainted with the work of foreign authors, and foreign literature on this subject usually arrives very late and in limited amounts.

"The problem of technically equipping the electrophysiological laboratories and of training qualified specialists in this field is very acute. To this day, there is a lack of a technically perfect and dependable Soviet multichanneled electroencephalograph and polygraph. The eight-loop oscillograph MPO-2, commonly used in physiological laboratories, has pronounced defects (narrow inscription on the film, insufficient supply of tape in the adapter, noise when in operation, etc.). Biopotential amplifiers, frequency analyzers, cathodo-oscillographic multichanneled units for physiological laboratories, photophonic stimulants, devices and appliances for work with microelectrodes, and other important devices are not being manufactured in any industrial establishments. The manufacture and distribution of unique perspective devices, similar to the electroencephaloscope of Anan'yev-Livanov, is not going well.

"The Presidium of the Academy of Sciences USSR issued a decree dealing with the organization of experimental workshops and special construction bureaus for manufacturing instruments of this type. However, the physiological establishments have to be satisfied to this day with their own haphazard way of manufacturing such instruments which they are not able to design or manufacture as efficiently as can be done in factories. Possibilities do exist for the rapid solution of these problems. For example, a bureau for manufacturing instruments, called 'Biofizpribor,' exists in Leningrad. This bureau has been functioning for several years. Physiological and clinical laboratories, however, have no access to this bureau: they have encountered a number of departmental barriers. 'Biofizpribor' is situated in the industrial section of Leningrad and is subordinated to the Ministry of Health. It does not have a base for distributing instruments because the Ministry of Health has no factories in Leningrad available that are assigned for that. If departmentalization is done away with and if contact is established between 'Biofizpribor,' the physiological and medical establishments of the city, and appropriate factories of the city, things could begin to move.

"The question of training cadres of physiologists in technical know-how also requires a speedy decision. It is regretable that neither the medical institutes nor the universities have taken cognizance of the fact that the present-day physiological and clinical research has reached a new, well-regulated plane of development."

Radiology

60. Roentgeno-Morphological Study of the Development of Osteogenic Sarcomas due to Strontium Poisoning

"Roentgeno-Morphological Study of the Development of Osteogenic Sarcomas in Animals Poisoned by Radioactive Strontium," by N. N. Litvinov and R. I. Makarycheva [illegible]ientific leader of the work, Prof N. A. Krayevskiy, Corresponding Member, Academy of Medical Sciences USSR); Moscow, Vestnik Rentgenologii i Radiologii, No 5, Sep/Oct 58, pp 36-44

The aim of this research was to study roentgenological and morphological changes in the appearance and development of osseous neoplasms in animals subjected to radioactive strontium introduced internally. Growth zones of long bones were selected for the study of changes due to strontium poisoning, because 80-90% of the radioactive strontium retained in the body is stored at these sites. Tests were conducted on 130 white rats, Sr^{90} was the source of radioactive radiation, and the animals were sacrificed 45, 120, 170, 220, and 290 days after the commencement of the experiments. Six photomicrographs accompany the article.

Results indicate the following:

"1. Increased amounts of pathological bone tissue indicate progressive disturbances in osteogenesis processes. The appearance of signs of resorption of the pathological bone, gradual decrease in its quantity, and changes in form and distribution of bone trabeculae indicate intensified bone tissue reorganization. With further distortion of the processes of osteogenesis similar changes can be considered as possibly being preneoplastic.

"2. The above-mentioned processes lead directly to the development of malignant growth.

"3. It is roentgenologically impossible to detect the very early phases in the development of osteogenic sarcomas. Characteristic roentgenological signs of initial stages of neoplastic growth appear in the bone marrow boundaries of the metaphysis. Later, further extension of the tumor along the bone marrow canal, the appearance of the tumor on the surface of the bone, and the growth of external neoplastic node become will outlined."

61. Single and Combined Effects of Inflammation and Polonium Injuries on the Phagocytic Reaction of Reticuloendothelial System

"The Effect of Inflammation on the Phagocytic Reaction of the Reticuloendothelial System in Animals Injured by Polonium," by A. I. Chuchukalo, Trudy Vsesoyuznoy Konferentsii po Meditsinskoy Radiologii (Works of the All-Union Conference on Medical Radiology); 1957, No 174-178; (from Meditsinskiy Referativnyy Zhurnal, Supplement, No 4, 1958, p 76)

"Tests were conducted on 210 mice, to which 0.005 millicurie of polonium was administered subcutaneously. An inflammatory process was developed by the subcutaneous injection of 0.01 ml of turpentine diluted with refined oil in a 1:1 ratio. To detect the phagocytic reaction, a one % solution of trypan blue or India ink was introduced intraperitoneally. The phagocytic reaction was studied in histological slides of the liver, lungs, spleen, skin, and lymph glands. The dye or India ink was introduced at one, 5, or 10 days after polonium injury, inflammation, or after the combined effect of both. The animals were sacrificed one, 3, or 5 days after the introduction of the dye. It was determined that the phagocytic activity of the reticuloendothelial system after single inflammation alone is significantly higher than in normal animals. The phagocytic reaction due to polonium injury alone proceeds in an undulatory form: during the first 5 days it was lower than in normal animals; during the period of 5-10 days, it was higher than in normal animals; and from the 10th to 15th day the phagocytic activity seemed completely inhibited. Phagocytic reaction of the reticuloendothelial system due to polonium injury, against a background of a 3-day inflammation, proceeded at a faster rate than

[the reaction] due to injury by polonium alone. The phagocytic activity of the reticuloendothelial system due to the simultaneous single introduction of polonium and an inflammatory agent and due to the effect of the inflammatory agent against a background of a 3-day injury by polonium proceeded essentially at the same level as that due to injury by polonium alone."

62. Local and General Favorable Effects of X-Ray Therapy on Frostbite

"X-Ray Therapy of Frostbite," by V. N. Agafonova, Chair of Surgery of the Sanitation Faculty (head, Prof K. N. Cherepnin), Tomsk Medical Institute; Moscow, Vestnik Rentgenologii i Radiologii, No 5, Sep/Oct 58, pp 90-91

Observations were made on 30 patients of various ages suffering from frostbite on the fingers, toes, wrists, hands, feet, knee joint, etc.

About half of the patients were treated on the first day, and the rest within 2-6 days after being hospitalized. X-ray therapy was repeated 2-9 times at 1-2-day intervals, and the total dose was 240-1,080 r. First degree frostbites were treated by two local irradiations with a total dose of 240 r. As the seriousness of the affliction increased, the number of local irradiations and the total dosage increased (up to 9 exposures and 1,080 r total dose).

Improved circulation was observed in the frostbitten part of an extremity after the first or second irradiation treatment. Necrotic tissue started to slough off in about 12 days, and in about 15 days it was completely off. Of the 30 patients treated, 26 were discharged with completely healed surfaces. The rest retained scars.

These results prove both local and general favorable effects of X-ray therapy on disturbed blood circulation in injured tissue (by allieviating blood vessel spasms) by improving trophic activities and regulating fundamental nerve processes.

63. New Respirator Model ShB-1 "Lepestok"

"Dustproof Respirator Model ShB-1 'Lepestok' for Protection of the Respiratory Organs From Radioactive Aerosols," by S. N. Shatskiy and P. I. Basmanov, Tr. Vses Konferentsii po Med. Radiol. Vopr. gigiieny i dozimetrii (Works of the All-Union Conference on Medical Radiology; Questions of Hygiene and Dosimetry); Moscow, Medgiz, 1957, pp 44-48 (from Referativnyy Zhurnal -- Khimiya, No 17, 10 Sep 58, Abstract No 57882, by I. Lekae).

"The existing dustproof respirators equipped with filters of cotton, felt, various filtering cardboards, and other material do not sufficiently remove radioactive aerosols from the air. In the Model Shb-1 respirator use has been made of a new fibrous filtering material (artificial, very thin fibers) which is hydrophobic, does not increase resistance to breathing, and has a high effectiveness. This respirator has fulfilled all hygienic requirements. The degree of cleansing approaches 99.9% of particles with diameters of 0.1-0.2 micron. The use of this respirator was contraindicated in the presence of oily fogs and volatile organic solvent vapors. Experiments conducted in a radiological laboratory with increasing doses of radioactive aerosols in the air exhibited a high degree of effectiveness and was easy to use. A description of the construction of the respirator is given."

Miscellaneous

64. Institute of Biological and Medical Chemistry, Academy of Medical Sciences USSR, To Coordinate all Biochemical Research

"First Methodical Ten-Day Conference in Institute of Biological and Medical Chemistry, Academy of Medical Sciences USSR," by T. S. Padkhina and V. D. Uspenskiy; Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, No 4, Apr 58, pp 94-96

The Institute of Biological and Medical Chemistry, Academy of Medical Sciences USSR, has been made responsible for directing and coordinating all biochemical research within the system of the Academy of Medical Sciences USSR and all clinics and chairs of medical institutions and scientific research institutes under the Ministry of Health USSR. By decision of the Scientific Council of the institute this directing and coordinating function will be conducted through periodically held 10-day conferences in which specific biochemical problems to be investigated will be discussed.

65. Independent Virology Laboratories Opened in Moscow

"Rayon Virology Laboratories" (unsigned article); Moscow, Meditsinskiy Rabotnik, 18 Nov 58, p 4

A Laboratory of the Diagnosis of Influenzal Diseases, Poliomyelitis, and Enteric Viruses (Laboratoriya Diagnostika Grippoznykh Zabolevaniy, Poliomiyelita i Kishechnykh Virusov) has been established on the base of the Sverdlovskiy Rayon Sanitary-Epidemiological Station in Moscow. Another such laboratory has been established in Leningradskiy Rayon of Moscow. These laboratories are the first of their kind to be opened in Moscow; they are to serve medical establishments and institutions located in their respective rayons.

66. Animal Husbandry and Veterinary Institute Opened in Moldavian SSR

"Institute of Animal Husbandry and Veterinary Medicine Formed" (unsigned article); Kishinev, Sovetskaya Moldaviya, 14 Sep 58, p 2

The Moldavian Scientific Research Institute of Animal Husbandry and Veterinary Medicine (Moldavskiy Nauchno-Issledovatel'skiy Institut Zhivotnovodstva i Veterinarii) has recently been established in the village of Krikovo on the base of the former Experimental Station of Animal Husbandry and Veterinary Medicine of the Moldavian SSR.

The new institute occupies an area of over 1,000 hectares. It has under its jurisdiction the State Station for Breeding and Artificial Insemination, plus a chemical laboratory under its Division of Feeding and Fodder Production.

67. Fiftieth Anniversary of Prof D. A. Zhdanov, Soviet Anatomist

"Dmitriy Arkad'yevich Zhdanov (50th Birthday)" (unsigned article); Moscow, Arkhiv Anatomii, Gistologii i Embriologii, No 5, Sep/Oct 58, pp 125-126

On 15 September 1958, Prof Dmitriy Arkad'yevich Zhdanov, Corresponding Member of the Academy of Medical Sciences USSR, Stalin Prize winner, and an outstanding Soviet anatomist, celebrated his 50th birthday.

Zhdanov graduated from the Medical Faculty, Voronezh State University, in 1929. His early scientific research was done under the direction of Prof G. M. Iosifov, and from 1929 to 1935 he was an assistant and docent at the Chair of Normal Anatomy, Voronezh Medical Institute; from 1935 to 1943 Zhdanov was head of the Chair of Human Anatomy, Gor'kiy Medical Institute; from 1943 to 1947 he was head of the Chair of Human Anatomy, Tomsk Medical Institute; from 1947 to 1956 he was head of the Chair of Human Anatomy, Leningrad Sanitary-Hygiene Medical Institute, at the same time (1943-1954) he was director of the Tomsk Medical Institute and the Leningrad Sanitary-Hygiene Medical Institute, respectively. At present, Zhdanov is head of the Chair of Anatomy, First Moscow Medical Institute.

Zhdanov is the author of over 60 scientific works, four of which are monographs concerning various aspects of human and animal lymphatic systems. He was awarded the Stalin Prize in 1946 for his book, Surgical Anatomy of the Thoracic Duct and the Principal Lymphatic Glands and Nodes of the Body.

68. Techniques for the Determination of Gas in Pure Metals

"Analysis of Gases in Metals (Conference at Moscow)," by Z. M. Turovtseva, Candidate of Physical Sciences; Moscow, Vestnik Akademii Nauk SSSR, Vol 28, No 9, Sep 58, pp 114-115

During recent years, the demand in a number of fields of science and technology for pure metals and pure semiconductor materials has increased sharply. Vacuum techniques in the field of electricity, nuclear technology, and the industry of heat-resistant alloys require such metals and materials. For this reason, methods for the determination of hydrogen, oxygen, and nitrogen in materials of this type have been developed to a considerable extent, because the three elements in question exert a pronounced effect on the physical and mechanical properties of the metals and materials involved.

A number of organizations have worked independently of each other on methods for the determination of gases in pure metals. Procedures were applied that are based on the evolution of gases melting of the metals in vacuum in the presence of an excess of carbon or on excitation of the gases in sources producing spectra and also radio-activation and mass-spectrometric procedures as well as other methods of analysis. However, the theory of this rapidly developing field of technical analysis had not been investigated sufficiently up to now. The advisability of using specific methods in this field must be discussed extensively and from every standpoint. For this reason, the necessity of conducting a conference on the subject arose. An All-Union Conference on the Analysis of Gases in Metals was therefore conducted by the Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy and the Commission on Analytical Chemistry of the Academy of Sciences USSR at Moscow, 24-27 June 1958. Thirty-four reports were presented and discussed. These reports dealt with the problem of the state in which gases occur in metals, the physicochemical basis of present-day methods for the determination of gases in metals, the characteristics traits of different methods applied for this purpose, and new equipment for such determinations.

Yu. A. Klyachko presented data pertaining to different forms in which gases occur in metals and the selection of methods of analysis depending on the state in which the gases to be analyzed are present. I. I. Kornilov reported the results of an investigation of the constitutional diagrams of systems formed by elements of the IVth group with oxygen and the significance of these results for analytical chemistry from the standpoint of the determination of oxygen in metals and alloys. The physicochemical relationships underlying the determination of gases in metals by the method of vacuum melting were discussed in a communication made by L. L. Kunin and Ye. M. Chistyakova.

A number of reports dealt with the method of vacuum melting, which is used most frequently for the determination of the content of gases in metals. The application of a platinum vessel for vacuum melting has considerably extended the possibilities of the application of this method, because the analysis can now be conducted at higher temperatures, so that the method becomes suitable for the investigation of a number of metals which could not be analyzed in this manner hitherto.

Several communications dealt with problems relative to the effect of alloying elements and phase transformations on the velocity of the diffusion of hydrogen in steels at high temperatures. Correlations between the chemical composition and structure of the steel and the methods to be used for the determination of hydrogen were discussed.

Data on further progress of work on the method of isotope equilibration combined with a final spectral analysis for the determination of hydrogen in metals were given in a number of communications. The method in question was originally proposed by A. N. Zaydel'.

Of great interest were reports dealing with the radioactivation method for the determination of oxygen, methods of isotope dilution and internal friction, and applications of the X-ray diffraction method for analytical purposes. Because of the inadequate capacity of the synchrotron used for this purpose, the sensitivity of the determination of oxygen by the radioactivation method is insufficient as yet. However, it follows from the considerations presented that this sensitivity can be brought to $1 \times 10^{-5}\%$. By using the method of isotope dilution, one can obtain very precise results in the determination of oxygen in metals, because complete elimination of the gas from samples is not required: only a statistically complete exchange affecting all atoms of oxygen present in the solid and gas phases is necessary. The method of internal friction and the X-ray method make it possible to determine small quantities (down to $1 \times 10^{-5}\%$ by weight) of elements dissolved in metals including gases. With the aid of this method, the first data were obtained on the content of oxygen in iron. Hydrogen, oxygen, and nitrogen that have entered the crystal lattice can be determined separately by this method, whereas only the total content of these gases can be determined by other methods. X-ray diffraction analysis of lower titanium oxides has shown that the curve representing the dependence of the "c" lattice constant on the content of oxygen in alpha-titanium rises steeply as the oxygen content increases. This finding made it possible to apply the X-ray method for the quantitative determination of oxygen dissolved in titanium.

Problems pertaining to the determination of oxygen in alkali and alkaline earth metals were discussed in a report by Ye. D. Malikova. In determinations of this type by the distillation method, the oxide can be separated from the metal by distilling the latter off in vacuum. A chemical analysis of the oxide then yields data on the content of oxygen in magnesium or calcium. The method of extraction with mercury is used for the analysis of sodium or potassium-sodium alloys.

A number of communications dealt with the distinguishing characteristics of present-day equipment for the determination of gases in metals by spectral, spectral-isotopic, and vacuum-melting methods.

The conference noted that, in connection with the development of new types of technology and the increased demand for the control of the content of gases in rare metals resulting therefrom, the principal task in the field of analysis of gases in metals is improvement of the sensitivity and precision of the methods applied. Very promising is work on the selection of optimum conditions for the separation of gases from metals by the method of vacuum melting, further improvement of the sensitivity of the radioactivation method, and development of methods involving isotope dilution followed by a final mass-spectrometric or spectrometric determination. Of considerable importance is the determination of gases in metals by the method of internal friction. One must pay particular attention to the development of spectral methods for the analysis of gases in metals. The high efficiency of methods of this type from the standpoint of the time consumed presents a definite advantage.

The conference emphasized that abnormal conditions exist as far as the production of equipment for the determination of gases in metals is concerned: it is necessary to organize the industrial production of equipment of this type.

69. K. A. Bol'shakov's Work on Rare Metals and Radioactive Elements

"Election of Academicians and Corresponding Members of the Academy of Sciences USSR" (unsigned article); Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 9, Sep 58, pp 1135-1154

Bol'shakov is a prominent investigator in the field of the chemistry and technology of rare, dispersed, and radioactive elements. He participated actively in investigations on the production of vanadium from the iron ores of the Kerch' Peninsula and from the titanomagnetites of the Urals. This work culminated in the organization of a production of vanadium in the USSR. Bol'shakov received a Stalin Prize for his work on the development of the technology of ferrovanadium production.

The subsequent scientific activity of Bol'shakov was concerned with the problem of the production of cobalt from USSR polymetal ores; he developed the technology of producing cobalt from ores containing arsenic as well as other types of ores. The work in question laid the foundation for the industrial production of cobalt in the USSR.

On the basis of many investigations carried out by Bol'shakov on problems pertaining to the production of dispersed elements from wastes and intermediate products, the industrial production of pure gallium, indium, thallium, and rhenium was organized.

Of great interest is Bol'shakov's work on the physicochemical aspects of technological processes for the production of rare elements and elements occurring in small quantities. This includes work on a process for the production of antimony and bismuth by the method of selective precipitation in smelting, processes for the roasting of cobalt-nickel ores and products of their conversion accompanied by chlorination and sulfatization and the conditions under which compounds of rare elements precipitate from solutions.

In recent years Bol'shakov has carried out a number of important investigations for which he received a Stalin Prize.

A general meeting of the Academy of Sciences USSR held on 20 June 1958 confirmed Bol'shakov's election as Corresponding Member of the Academy of Sciences USSR in the specialized branch of technical chemistry by the Department of Chemical Sciences.

[For additional information on metallurgy, see Item No 10.]

IX. PHYSICS

Crystallography

70. Absorbing Crystals

"Optics of Absorbing Crystals. IV. Classification," by F. I. Fedorov, Institute of Physics and Mathematics, Academy of Sciences USSR; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 450-461

All possible varieties of absorbing crystals of lower syngonies are analyzed from the viewpoint of the numbers and characters of optical axes. The possibility of existence of isotropic optical axes in such crystals was established. It was shown that, in contradistinction to transparent crystals, absorbing crystals belonging to rhombic, monoclinal, and triclinal syngonies exhibit optical properties which essentially vary with the system. It was shown that the total number of different types of absorbing crystals reaches 16, instead of the 3 which must exist on the basis of the theory by Voigt-Drude. A full classification is presented of absorbing, inactive, nonmagnetic crystals according to their optical properties.

71. Absorbing Magnetic Crystals

"Optics of Absorbing Magnetic Crystals. I. Polarization of the Homogeneous Plane Waves," by L. M. Tomil'chik and F. I. Fedorov, Belorussian State University imeni Lenin; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 462-468

The problem of polarization of plane homogeneous electromagnetic waves is analyzed in a general invariant form. The waves are assumed to propagate in an inactive medium possessing an arbitrary anisotropy of dielectric, magnetic, and conducting properties.

Hydrodynamics

72. Shock Waves

"Refraction and Reflection of Shock Waves at the Boundary of Two Media. I. Case of Normal Incidence," by A. L. Gubanov, Physico-technical Institute, Academy of Sciences USSR, Leningrad; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 2035-2040

A general equation from which can be found the pressure in a reflected shock wave at normal incidence of a plane shock wave on a plane boundary separating two arbitrary media is derived. This equation is approximately solved for the case of two ideal gases, for shock waves of low intensity, for two slightly different media, and for two strongly different media.

73. Plasma in a Magnetic Field

"Acceleration of Plasma in a Magnetic Field," by G. V. Gordeyev and A. I. Gubanov Leningrad Physicotechnical Institute, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 2046-2054

Acceleration of plasma, located between two infinite coaxial cylindrical electrodes, by an external axial magnetic field is analyzed. The stationary plasma flow is computed taking into account its friction against the electrodes. The relation of the velocity of this flow to the magnetic flux and the radii of the electrodes and the energy spent on the maintenance of the flux are also computed. The computations showed that at practically realizable parameters of the equipment a supersonic velocity of the plasma flow may be reached.

74. Supersonic Velocity of a Hydrojet

"Distribution of Momentum in a Continuous Fluid Jet at a Supersonic Velocity," by A. A. Semerchan, L. F. Vereshchagin, F. M. Filler, and N. N. Kuzik, Laboratory of the Physics of Superhigh Pressures, Academy of Sciences USSR, Moscow; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 2062-2071

The distribution of momentum in a continuous fluid jet emanating from a nozzle with supersonic velocity was obtained. By plotting curves of momentum distribution, the boundaries of the free fluid jet were determined. Agreement with the photographic observations was noted. It was established that an increase in the viscosity of the fluid jet decreases the angular spread of the emanating cone. The applied methods and computations facilitated the finding of the velocity field and the distribution of kinetic energy in fluid jets at supersonic velocity.

75. Luminescence of Tungstates

"Luminescence Kinetics of Some Tungstates and Zinc Oxide," by V. A. Arkhangel'skaya and N. A. Tolstoy, State Optical Institute imeni Vavilov; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 415-422

The taumeter method was applied to the study of kinetics of cathode luminescence of fast technical luminophores (tungstates and zinc oxide) in a time interval of 10^{-7} to 10^{-5} sec at various temperatures.

Mechanics

76. Solution of Partial Differential Equations With Two Variables Studied

"On Perturbed Problems for Partial Differential Equation With Two Independent Variables," by Academician S. L. Sobolev; Moscow Doklady Akademii Nauk SSSR, Vol 122, No 4, 1 Oct 58, pp 555-558

The equation

$$\partial^n u/\partial t^n + \sum_{k<n,\ q\le m} A_{k,q}\, \partial^{k+q} u/\partial t^k \partial x^q = f \qquad (1)$$

with constant coefficients, two independent variables, one unknown function, and satisfying the Petrovskiy condition for the uniform correctness of the Cauchy Problem is studied in the regions

a) $-\infty < x < +\infty, \quad 0 \le t < +\infty;$

b) $0 \le x < +\infty, \quad 0 \le t < +\infty$

c) $0 \le x \le l, \quad 0 \le t < +\infty.$

for the initial conditions

$$u\Big|_{t=0} = \partial u/\partial t\Big|_{t=0} = \ldots = \partial^{n-1} u/\partial t^{n-1}\Big|_{t=0} = 0$$

and for the homogenous boundary conditions

$$\sum_{i=1}^{m-1} \sigma_t^{(s)} \, \partial^i u / \partial x^i \Big|_{x=0} = 0, \quad s=1,2,\ldots,p_-,$$

for b) and c) and

$$\sum_{i=1}^{m-1} h_i^{(s)} \, \partial^i u / \partial x^i \Big|_{x=1} = 0, \quad s=1,2,\ldots,p_+,$$

for c).

The conditions, which must be satisfied in order that the problem have a solution are given.

Nuclear Power Development

77. USSR Progress in the Field of Nuclear Power

"The Future of Nuclear Power in the USSR", by V. S. Yemel'yanov; Moscow, Atomnaya Energiya, Vol 5, No 3, Sep 58, pp 217-222

During the past 3 years, work in the field of nuclear power generation and nuclear physics progressed to a considerable extent. The increased emphasis on thermonuclear reactions must be noted.

The USSR has extensive power resources in the form of organic fuel and hydroelectric energy, which will last for a considerable length of time. During 1946-1951, major deposits of petroleum were discovered which increased the available supply of fuel by a factor of 2 During 1951-1955 (up to January 1956) additional deposits of petroleum were discovered which increased the supply available in 1951 by a factor of 2.5 The available deposits of natural gas comprise 1,860,000,000,000 cubic meters, while the total supply in the USSR including deposits which have not yet been discovered is estimated to be equal to 13 trillion cubic meters. However, the power available in some parts of the European USSR, where a considerable part of the industry is concentrated, must be regarded as rather limited: nuclear energy can already be used to advantage for the generation of power in these parts of the country. Nuclear energy power-generating plants will also be of immediate economic advantage in some remote parts of the country including regions in the north. Furthermore, coal, petroleum, oil shale, and natural gas represent a valuable crude material for the chemical industry and should not be wasted by using them as fuel: nuclear energy should replace the power generated by the use of chemical fuels.

The first USSR nuclear plant generating electric power has now been in operation for more than 4 years without interruption. On the basis of experience acquired at the first USSR nuclear electric power plant, the practical possibility of achieving a burn-out of more than 95 kg per ton of uranium has been established. It is known that the stability of the fuel elements can be increased if alloys of uranium or uranium oxide are used instead of pure uranium and heat-resistant steel is used as a cladding for the fuel elements; however, in this case, the nautral uranium must be enriched either with U^{235} or with plutonium. Although this enrichment will increase the extent of the burn-out, it will raise the cost of the fuel elements.

The majority of the nuclear energy plants for the generation of electric power which are being constructed in the USSR or planned there will be equipped with reactors using ordinary water as a coolant. Ordinary water is not only a good moderator, but also an efficient heat-transfer agent, the degree of activation of which is within safe limits, because the activated nuclei have a very short half-life.

At present a nuclear energy electric power plant with a capacity of 420,000 kw is being constructed in Voronezhskaya Oblast'. At this power plant, two reactors of the water-water type will be installed. Water under a pressure of 100 atmospheres absolute will be used as the heat-transfer agent. Saturated steam with a pressure of 29 atmospheres absolute will be generated by the pressurized water passsing through the boilers.

Zirconium-covered elements consisting of uranium oxide that has been enriched to the extent of 1.5% will be used in the reactors.

A second nuclear electric power plant of the same type will be erected in Leningradskaya Oblast.

When more experience has been acquired in the operation of power plants with reactors of this type, steam for the turbines will presumably be generated directly in the reactors, i.e., the intermediate heat-transfer phase will be eliminated.

At present in Ul'yanovskaya Oblast' on the Volga a "boiling water" reactor of the water-water type is being constructed. This reactor will have an electric power capacity reaching 50,000 kw and will be equipped with fuel elements resembling those of the power plants in Voronezhskaya and Leningradskaya oblasts.

Experimental power-generating reactors of different types are being constructed on the Volga and a large center is being created there at which scientific and technical experiments on nuclear power generation will be conducted. The purpose of this center is testing of reactors under conditions corresponding to industrial operation.

A nuclear energy electric power plant being constructed in the Urals will have a capacity of 400,000 kw. At this plant steam will be generated in the reactor itself. The reactors employed at this plant will represent a further development of the reactor type installed at the first nuclear electric power plant. At the Ural Electric power plant four reactors will be installed which will have a capacity of 100,000 kilowatts each. Each of them will operate as a unit with a turbine. Steam at a pressure of 90 atmospheres and a temperature of 480-500°C will be fed into the turbines directly from the reactors.

The fuel elements in the reactors of this plant will be of the same type as those used in the reactor of the first USSR nuclear energy electric power plant. However, they will have a length of 6 meters instead of 1.7 meters. In connection with the operation of this type of reactor, studies have been made on the activation of the water and of the salts and corrosion products dissolved in it. The design of the fuel elements is such that fission products will not get into the coolant circuit.

The desire to reduce the cost involved in the production and treatment of fuel elements induced research on homogeneous power generating reactors. To conduct work on this subject, a reactor employing heavy water in which uranium is dissolved or suspended is being constructed on the Volga. Experiments that have been carried out indicate that the suspension of the uranium in water is sufficiently stable. It is assumed that in the reactor under construction the water will boil at a pressure of 50 atmospheres absolute and that uranium oxide will be suspended in the core of the reactor. The reactor will have a thermal capacity reaching 35,000 kw. The stability of the operation of boiling-water reactors will be determined on this prototype. A reactor of this type will also make it possible to determine the efficiency of the thorium cycle.

The possibility of utilizing in practical operation reactors in which liquid sodium functions as the heat carrier will be conducted using a research reactor with an electric power capacity reaching 50,000 kw. This reactor will also be constructed on the Volga. The reactor in question is designed for the generation of high-parameter steam, namely, steam at a pressure of 90 atmospheres absolute having a temperature of 500°C. The maximum pressure of the heat-transfer agent in the core will not exceed 8 atmospheres absolute, which is of great advantage and compares favorably with reactors using water as a coolant. At this plant and at all others using sodium as a coolant and water in the final stage, an intermediate heat-transfer cycle must be employed, so that no interaction between the water and the radioactive sodium may occur.

Extensive work is being done on fast neutron reactors. It was established that the breeding ratio in such reactors will definitely exceed unity. Thus, the crude nuclear fuel (primarily U^{238}) can be fully utilized in fast neutron reactors, as distinguished from reactors operating on thermal neutrons.

At present principal attention in work in this field is being paid to the solution of technological problems including those of a high degree of heat removal, a high coefficient of burn-out (of the order of 20-30% and higher), and efficient methods for the recovery of irradiated fuel. The first fast neutron reactor was started in the USSR in April 1955. This reactor had a zero capacity. In February 1956 a fast neutron reactor with a capacity of 100 kw was started. This reactor has plutonium fuel elements and uses mercury as a coolant.

In July 1958 an experimental reactor operating on fast neutrons was started in the USSR. This reactor has a capacity of 5,000 kw. It has a plutonium core and operates with sodium cooling. As far as its characteristics are concerned, it resembles industrial reactors operating on fast neutrons. The flux of fast neutrons in the center of the core approaches 10^{15} neutrons/cm^2 seconds.

The temperature of the sodium at the exit amounts to 500°C. This reactor will be used for the study of operational characteristics of reactors operating on fast neutrons and for the testing of constructional materials. The results obtained in work on this reactor will aid in designing more precisely fast-neutron reactors for two industrial nuclear power plants. One of these reactors, which will have an electric power capacity reaching 50,000 kw, will be erected on the Volga. The second power plant reactor, which will have an electric power capacity of 250,000 kw, will be built later in a location which has not yet been decided on definitely.

Work is being conducted in the USSR on the employment of the thorium cycle.

In addition to the investigation and development of reactors already planned for construction, investigational work is being done on reactors with a liquid metal core and reactors using organic coolants and other types of coolants.

To conduct the necessary experiments on the stability of materials for fuel elements, an experimental reactor with a capacity of 50,000 kw is being constructed in the USSR. This reactor will operate on neutrons of intermediate velocity. Use of the intermediate range of neutron velocity makes it possible to obtain higher values of neutron flux per kw of capacity than in the case of reactors operating on thermal neutrons. The neutron flux in the reactor in question will exceed 2×10^{15} neutrons/cm^2. seconds. This flux intensity will make it possible to shorten considerably the time required for investigations and to increase the speed of research work. This reactor will also be used for research in nuclear physics, including investigations on transplutonium elements.

In addition to the construction of stationary nuclear power plants, work is being conducted in the USSR on the development of transportable nuclear electric power plants. At present work is being completed on the construction of a mobile nuclear electric power plant equipped with a reactor of the water-water type and having an electric power capacity of 2,000 kw. The reactor of this plant is located in a shell with a diameter of about one meter and a height of 2.2 meters. Ordinary water at a pressure of 120 atmospheres gauge is used as a coolant and moderator. In the secondary phase or cycle a turbine will be used which operates at a steam pressure of 20 atmospheres absolute and a temperature of 280°C. Toward the end of 1958, a power plant of this type will be assembled on the grounds of the first nuclear electric power station, so that testing can be carried out.

Calculations show that it is possible to build a reactor with a core assembly consisting of beryllium oxide or graphite and ceramic fuel elements cooled by a gaseous heat-transfer agent (nitrogen or helium) the temperature of which will go up to 700°C. A reactor of this type will have a number of advantages. Specifically, the use of ceramic fuel elements will make it possible to increase considerably the degree of burn-out. On the other hand, the high temperature of the coolant makes it possible to increase the economy of the operation of the heat-transfer circuit and opens prospects for using a reactor of this type for the direct operation of a gas turbine cycle without an intermediate second cycle.

Transportable nuclear power-generating installations will be applied in localities where new industries are being built and in parts of the country where sources of electric power are absent. It is evident that installations of this type will also be of interest for use in countries other than the USSR.

Considerable attention has been paid in the USSR to the problem of controlled thermonuclear reactions. Research on the synthesis of nuclei is being conducted in the USSR on an extensive scale. An idea in regard to the scope of this work can be formed on the basis of reports made by Soviet physicists at the Second Geneva Conference. Collections of papers reporting the results of 100 investigations on problems of nuclear fusion carried out by USSR scientists were submitted to the Second Geneva Conference. Work of this type is being conducted at various laboratory installations and installations of larger size. One of them is similar to the British "Zeta" installation.

All available information supports the conclusion that apparently reactors operating on a mixture of deuterium with tritium will be developed first and then reactors operating on pure deuterium. To initiate the reaction in a mixture of deuterium with tritium, it is necessary to bring this mixture to a temperature of 80-100 million degrees. On the basis

of possibilities opened by the present state of engineering, one must conclude that a reactor is feasible which exhibits a density of power generation amounting to millions of kilovatts per cubic meter of plasma derived from this mixture. This density of power generation is higher than in the core of any other installation for the production of power including nuclear reactors and reaction engines. Thus, one must conclude that deuterium-tritium reactors are feasible which are sufficiently compact to be installed on ships and to be used for similar applications.

One must assume that engineering problems pertaining to deuterium reactors will be solved later than those involved in the operation of deuterium-tritium reactors.

Solid State Physics

78. Semiconductor Kinetics

"Kinetics of Some Electronic Processes in Semiconductors" by V. Ye. Lashkarev, E. L. Rashba, V. A. Romanov, and Z. A. Demidenko, Physics Institute, Academy of Science Ukrainian SSR, Kiev; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 1853-1870

The kinetics of photoconductivity, volume emf, photomagnetic effect, and photoconductivity in a magnetic field of a semiconductor are investigated. General formulas for the values of the listed effects are derived. The problem of determining parameters of the volume and surface recombination from a simultaneous analysis of kinetics of several electronic processes is discussed. It is noted, in particular, that the combined study of kinetics of photoconductivity and volume emf facilitates a simple explanation of carrier trapping. The derived general formulas are applied to the study of a number of particular cases. Experimental equipment is devised with a Kerr cell permitting measurements in a wide range of temperatures and frequencies with high accuracy. Experimental data on kinetics of photoconductivity and volume emf were compared with theory with satisfactory results.

79. Photovoltaic Cells

"Kinetics of the Photovoltaic Cells With Electron-Hole Junctions," by S. M. Ryvkin, N. B. Strokan, and L. I. Makovskiy, Leningrad Physicotechnical Institute, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 1871-1882

The kinetics of a photodiode in voltaic operation is analyzed.

The relaxation curves of the dropping branch are computed for various conditions. It is shown that by upsetting the conditions taken in the article by N. A. Tolstoy and P. P. Feofilov, (ZhETF , 19, 921, 1949) (infinite load resistance, low capacitive currents), but at a sufficiently high intensity of illumination, the relaxation curve retains a section determined only by recombination which may facilitate the determination of the lifetime of unbalanced carriers. The conclusions were confirmed experimentally.

80. Volume-Gradient EMF in Germanium

"Volume-Gradient EMF in the Presence of Current in Germanium," by P. I. Baranskiy and E. L. Komukhayev, Physics Institute, Academy of Sciences Ukrainian SSR, Kiev; Leningrad. Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 1896-1904

Experimental proof is given of the appearance of volume-gradient emf in the presence of current in germanium. The correlation of variations of the volume-gradient emf and of ρ to the coordinate was established. It was shown that the volume-gradient emf in n- and p- type germanium have opposite signs. Attention is drawn to the fact that in the case of semiconducting materials a very high accuracy in measuring the electric characteristics (by means of a probe method) cannot be reached if the volume-gradient emf is ignored.

81. Volume Recombination of Germanium

"Volume Recombination of Aluminum-Doped Germanium," by S. G. Kalashnikov and K. P. Tissen, Moscow State University, Physics Faculty, Chair of Semi-conductors; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 1890-1895

The effect of aluminum concentration on the lifetime of transit electrons in germanium is studied. It was found that the effect of aluminum on recombination practically consists only in a shift of the Fermi level and therefore it is not a good alloy for obtaining of hole-type germanium with high electric conductivity and long electron lifetime. The upper limit of the recombination coefficient of electrons on aluminum atoms was calculated to be about 10^{-12} cm^3/sec. The relation of concentration to the lifetime shows that the cross section of trapping of the recombination centers in the studied samples does not depend on the concentration of equilibrium holes, thus proving the insignificance of collision recombination.

82. Photoelectronic Germanium Emission

"Photoelectronic and Secondary Electron Emission of Germanium," by P. G. Borzyak and O. G. Sarbey, Physics Institute, Academy of Sciences Ukrainian SSR, Kiev; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 1905-1912

The photoelectronic emission of W-BaO and Ge-BaO cathodes was studied in the visible part of the spectrum. The spectral characteristic of the photoeffect of a W-BaO cathode satisfies the Fauler theory as does a pure W-cathode. The value of the photoeffect threshold was found to be 1.9 ev. The work function was found to be 1.8 ev. A decrease of the work function strongly affects the secondary electron emission of germanium.

83. Carrier Density in Semiconductors

"Fluctuation of the Carrier Density in Semiconductors," by S. V. Ayrapetyants, Leningrad Institute of semiconductors; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 1913-1916

Fluctuations of carrier density in semiconductors provoked by thermodynamically unsteady ("frozen") fluctuations in the distribution of donors N_d and acceptors N_a are analyzed for the case when both are present in nearly equal quantities simultaneously. A formula for the volume concentration c is obtained $c \propto \frac{1}{s} e^{-a^2}$, where $a = 1/7 (21/\pi)^{1/4} n^{1/4} N^{-1/2} (\varepsilon \Delta \mu/e)^{3/4}$, $\Delta \mu$ is the shift of the level of the chemical potential in the region of fluctuations, expressed in potentials units, $n = (N_a - N_d)$, $N \cong N_a \cong N_d$, and ε is the dielectric constant. The linear dimensions of the fluctuations are $L \approx 10^3 (\Delta \mu \varepsilon/n)^{1/2}$.

84. Thermoelectromotive Force of Heterogeneous Systems

"Thermoelectromotive Force and the Additional Heat Conductivity of Heterogeneous Systems," by S. V. Ayrapetyants and M. S. Bresler, Institute of Semiconductors, Leningrad; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, 1935-1938

The coefficient of the thermo-emf of a polycrystal, the increase of thermal conductivity of a polycrystal provoked by the heterogeneity of its thermoelectric properties, and the coefficient of the thermo-emf

of matrix system in the case of small concentrations of matrix phase and small concentrations of impurities are calculated. The coefficient of the thermo-emf of a statistical mixture was computed by the author in ZhTF, v. 27, No 3, 478 (1957); as a continuation, the coefficients of thermo-emf of two other types of heterogeneous systems, the polycrystal and the matrix system, are computed.

The heterogeneous system is called a matrix system if one of its phases produces a continuous matrix into which other particles are doped, always separated from each other by a matrix phase.

85. Diffusion of Excitons

"Effect of the Inhomogeneous Electrical Field on the Diffusion of Excitons," by Z. S. Gribnikov and E. I. Rashba, Physics Institute, Academy of Sciences Ukrainian SSR, Kiev; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 1948-1958

An exciton moving in a heterogeneous electric field is attracted toward the region of the strong field because of the appearance of an induced dipole moment; if the exciton carries a constant dipole moment, it may be either attracted into the strong field or be repulsed from it. The diffusion equation is solved for a number of cases, containing terms describing the action on excitons of the heterogeneous field in the region of the near surface bending of zones. At a specified near surface bending of electronic zones the effect of variation of the boundary concentration of excitons increases with the growth of the velocity of field drop to the depth of the sample. As a rule the effect of the bending of zones on the effective lifetime of excitons cannot be taken into account by renormalization of the velocity of the surface recombination, as this would introduce a change in its spectral relation. The analyzed effect is essential at low temperatures.

86. Excitons in Ionic Crystals

"Excitons in Ionic Crystals With Intermediate Bonding," by I. M. Dykman and I. G. Zaslavskaya, Physics Institute, Academy of Sciences Ukrainian SSR, Kiev; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58 pp 1959-1965

Excitons in ionic crystals were analyzed using the method of intermediate bonding by V. M. Buymistrov and S. I. Pekar [ZhETF, 32, 1193 (1957).] At all values of the crystal parameters a drop in the energy

level of the system was obtained in comparison with the hydrogen types. On the account of interaction with the lattice the energy value decreases linearly with n^2a, and starting with certain values the relation may become more pronounced. The two exciton types previously obtained by I. M. Dykman and S. I. Pekar (Tr. Inst. fiz. AN Ukrainian SSR, No 3, 92, 1952) are physically confirmed, from the viewpoint of the more general method, as limiting cases of strongly and weakly bound excitons.

87. Superfine Structure of NaCl Crystals

"Spin-Electron Resonance in the Stoichiometric Excess of a Metal in Crystals of NaCl Type," by M. D. Glinchuk and M. F. Deygen, Physics Institute, Academy of Sciences Ukrainian SSR, Kiev; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 1981-1990

The superfine structure of energy terms of a valence electron of a metal atom embedded in the interstice of a lattice of the NaCl type is computed. The form, width, and band intensity of spin-electron resonance on stoichiometric excess metal atoms were obtained (the paramagnetic resonance in the F-center of the Gilsh and Pohl model). The paramagnetic resonance in Na atoms embedded in NaCl is analyzed quantitatively. The results differ qualitatively from the corresponding ones obtained for F-centers in the de Boer model. On the basis of the shape of bands of paramagnetic resonance, it is then possible to construct a model for the F-center of various crystals.

88. Reactions to Gamma Rays

"Investigations of Some Properties of Gamma-Irradiated Polyethylene," by B. I. Sazhin, A. M. Lobanov, A. L. Goldenberg, T. N. Sarminskaya, I. A. Marakhonov, and S. P. Kabin, Scientific Research Institute of Polymer Plastics, Institute of High-Molecular Compounds, Academy of Sciences USSR, Leningrad; Leningrad Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 1991-1998

An investigation on infrared spectra, radiograms, and mechanical and dielectric losses in potential of polyethylene in block form irradiated by gamma rays is described. It is shown that at irradiation doses up to $80 \cdot 10^6$ r in polyethylene blocks there occur a junction and a change of macromolecule structure which causes a change in mechanical and dielectric losses.

89. Tension States in Fine-Grained Polycrystals

"Optical Method of Investigation of the Averaged Tension States in Fine-Grained Polycrystals. IV. Action of a Concentrated Force on the Anisotropic Polycrystalline Plates," by R. A. Zhitnikov, Kazan State Pedagogical Institute; Leningrad, Zhurnal Teknicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 2004-2010

An optical method was used for studying tension states occurring under action of a concentrated force in polycrystalline plates of silver chloride, obtained by pressing and rolling at various directions of a concentrated force with respect to the axis of pressing or rolling. Some peculiarities of piezooptic behavior of texturized polycrystalline plates of silver chloride under an acting concentrated force are clarified.

90. Tension States in Fine-Grained Polycrystals

"Optical Method of Investigation of the Averaged Tension States in Fine-Grained Polycrystals. V. Tensions on Free Contours of Anisotropic (Texturized) Polycrystalline Plates," by R. A. Zhitnikov, Kazan' State Pedagogical Institute; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 28, No 9, Sep 58, pp 2011-2018

An optical method was used for studying the tension distribution on free contours and problems of concentration of tensions at elongation of anisotropic (texturized) polycrystalline plates of silver chloride, having apertures and grooves. The diametral compression of flat rings prepared from such polycrystalline plates was also studied.

91. Vibrational Spectra of Unsaturated Hydrocarbons

"Vibrational Spectra of Unsaturated Hydrocarbons. VI. Calculation and Interpretation of the Vibrational Spectra of Butene-1, Pentadiene-1.4 and 1.1-Dimethylallene," by L. M. Sverdlov, M. G. Borisova, N. V. Tarasova, Saratov Automobile Road Institute and All-Union Automobile Road Correspondence Institute; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 354-364

Computation is carried out of normal oscillations of butene-1, pentadiene-1.4, and 1.1-dimethylallene. The computed and observed frequencies concurred satisfactorily. The obtained results were used as a basis for interpretation of molecular spectra of the RCH = CH_2 series (from pentene-1 to undecene-1) and of diallyl. The characteristic frequencies of RCH=CH_2 were determined with greater accuracy and the characteristic frequencies of diolefins and dialkyl substituted allene were theoretically established.

92. Identification of Cis- and Trans-Isomers

"On the Possibility of Identification of Cis- and Trans-Isomers (in Relation to the Double Bond C = C) in Disubstituted Derivatives of Ethylene on the Basis of Vibrational Spectra. I. Formulation of the Problem. Beta-Vibrations," by L. S. Mayants, Institute of Organoelemental Compounds, Academy of Sciences USSR, Optics Laboratory; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 369-377

A method is indicated for clarifying the possibility of identification of cis- and trans-isomers of ethylene derivatives on the basis of ocillatory spectra. A model computation is carried out of beta-oscillations for some disubstituted ethylene derivatives and on the basis of an analysis of the dependences of beta-frequencies on various parameters, the probable limits are indicated of applying the analogy concerning the position of beta-frequencies for the identification of cis- and trans-isomers of similar compounds.

93. Calculation of Derivatives of Vibration Frequencies

"Improved Method of Calculating Partial Derivatives of Normal Vibration Frequencies in Polyatomic Molecules on the Basis of Different Parameters," by L. S. Mayants, Institute of Organoelemental Compounds, Academy of Sciences USSR; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 378-383

An improved method is devised for computing the values of partial derivatives from the frequencies of normal oscillations of molecules on the basis of different parameters on which they depend.

94. Rotational Spectrum of Water

"Rotational Spectrum of H_2O in the Long-Wavelength Infrared Region 50-1500 μ (200 - 7 cm^{-1})," by N. G. Yaroslavskiy and A. Ye. Stanevich, State Optical Institute imeni Vavilov; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 384-392

A specially devised vacuum spectrometer DIKS-1 recording long waves was used with a new opticoacoustic radiation receiver and a set of diffraction gratings with constants from 0.0833 to 2.5 mm. The optimal resolution was 0.2 to 0.3 cm^{-1}; the accuracy in determining wave numbers, 0.02 cm^{-1}; and the precision in determining intensities, 5-10%. About 100 absorption bands of rotational spectra of vapors of H_2O, 34 of which were detected for the first time, were recorded in the region of 50-1500 μ. A full interpretation of the rotational spectrum of H_2O was given and it was shown that the found experimental values of wave numbers of bands agree, within the error margin, with the computed values.

95. Infrared Spectroscopy

"Thermal Radiation Background in Infrared Spectroscopy," by B. I. Stepanov and Ya. S. Khvashchevskaya, Institute of Physics and Mathematics, Academy of Sciences Belorussian SSR, Belorussian State University imeni Lenin; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 393-403

Formulas are derived which make it possible to take into account the thermal emission of a radiation receiver and of the vessel with the investigated material. The concept of negative radiation flow

is introduced. The possibility of making use of cold bodies (sources of light) for the determination of absorption coefficients was proved. Methods for determining the temperature dependence of absorption coefficients taking into account the thermal radiation background are devised. A method of determining the absorption coefficient from measurements of thermal emission of a plane parallel layer is proposed. An experimental check of the theory is carried out.

96. Exciton Absorption

"On Optical Characteristics of Molecular Crystals in the Region of Exciton Absorption," by A. F. Lubchenko, Physics Institute, Academy of Sciences Ukrainian SSR; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 404-414

In an approximation to a weak bond the general expressions were obtained for the extinction coefficient χ, the refraction index n, and the gyration vector γ of molecular crystals in the region of exciton absorption. Actual computations of the relation of n, χ, and γ to the frequency of the incident light were carried out for an isotropic crystal, considered as a Debye continuum, with the Born condition for the determinations of ω_{max} at $T = 0$. For this case the relation of n, χ, and γ to the effective exciton mass was found.

97. Fluorescence Spectra

"Concerning the Effect of Temperature on Fluorescence Spectra of Phthalimide Derivatives," by V. V. Zelinskiy and V. P. Kolobkov, State Optical Institute; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 423-427

The positions of fluorescence spectra of solutions of various phthalimide derivatives at -196°C were compared with those at 20°C. It was shown that the successive action of solvents on the fluorescence spectra exhibited at 20°C and governed by the chemical nature of the solvent is completely destroyed when the temperature drops to -196°C. The different action of media on fluorescence spectra as a result of the reduction of temperature is ascribed to the independent action of several factors on the spectra, primarily a temperature expansion or dilation and a change in the rigidity of the medium.

98. Spectra of Colloids

"On Spectral Properties of Solid Colloidal Layers of Dyestuffs," by L. A. Lyzina, State Optical Institute imeni Vavilov; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 428-434

Solid two-dimensional colloidal layers of a number of dyestuffs were obtained and their absorption spectra measured. The conditions of obtaining colloidal layers by depositing dyestuffs from true solutions were studied. It was established that the layers may be either amorphous or crystalline with correspondingly different spectral properties.

99. Absorption Spectra of Dyestuffs

"Absorption Spectra of Solid Films of Organic Dyestuffs," by N. M. Melankholin, Institute of Crystallography, Academy of Sciences USSR; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 435-439

Absorption spectra of dyestuff films deposited on solid supports have been studied. It is shown that if the absorption spectra of dyestuff crystals are known, amorphous films may be distinguished from crystalline ones, and the orientation of microcrystals in the films may also be determined.

100. Weakly Absorbing Scattering Medium

"Conditions Affecting Light Within a Weakly Absorbing Scattering Medium and Some Possibilities of Spectroscopy," by G. V. Rozenberg, Institute of Physics of the Atmosphere; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 440-449

The conditions pertaining to light within a weakly absorbing isotropic scattering medium are analyzed. It is shown that with the increase of the specific absorbing power of the medium the stationary intensity body elongates with the result that a stationary polarization of the emission is produced. The relation of the radiation intensity to the depth is expressed by an exponential law with an attenuation constant different from the extinction coefficient and proportional in first approximation to the square root from the product of the absorption

coefficient and the extinction coefficient; the coefficient of proportionality depends on the type of the scattering indicatrix. Spectroscopic applications of the obtained rules are indicated.

101. Optic Constants of Copper and Gold

"On the Optical Constants of Copper and Gold," by M. V. Savostyanova, State Optical Institute imeni Vavilov; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 469-472

Experimental spectral curves of weakening obtained for colloidal copper solutions were compared with those computed according to the Mie-Rayleigh theory. It is shown by this comparison that the spectral behavior of values of optical constants of copper obtained by M. P. Givens (J. Opt. Soc. Amer., 45, 229, 1955) cannot be correct.

102. Dispersing Light Filters

"Spectrophotometric Properties of Dispersion Light Filters," by A. P. Ivanov, State Optical Institute imeni Vavilov; Moscow, Optika i Spektroskopiya, Vol 5, No 4, Oct 58, pp 473-477

The transmission and polarization spectra of dispersing light filters were studied, as well as their indicatrices of dispersion. The possibility is indicated of applying these light filters for dimming the light in a narrow spectral range.

X. MISCELLANEOUS

103. Polytechnic Institute Established in Riga

"In the New Institute," by O. Ivanov; Riga, Sovetskaya Latviya, 4 Sep 58, p 2

The Riga Polytechnic Institute (Rizhskiy Politekhnicheskiy Institut) was established recently in the City of Riga. It is located on Komsomol'skaya Naberezhnaya. The institute has a Faculty of Construction, a Faculty of Mechanics, a Faculty of Electrical Power Engineering, a Correspondence Faculty, and an enrollment of 3,200 students. The institute also has a Laboratory of Isotopes, a Laboratory of Steam Technology, a Laboratory of [Metal] Cutting (Rezaniya), and others, including a soon to be established experimental laboratory.

* * *